

Cell Biology

SLIDE Masters

FELTHAM PRESS

MICROSCOPY

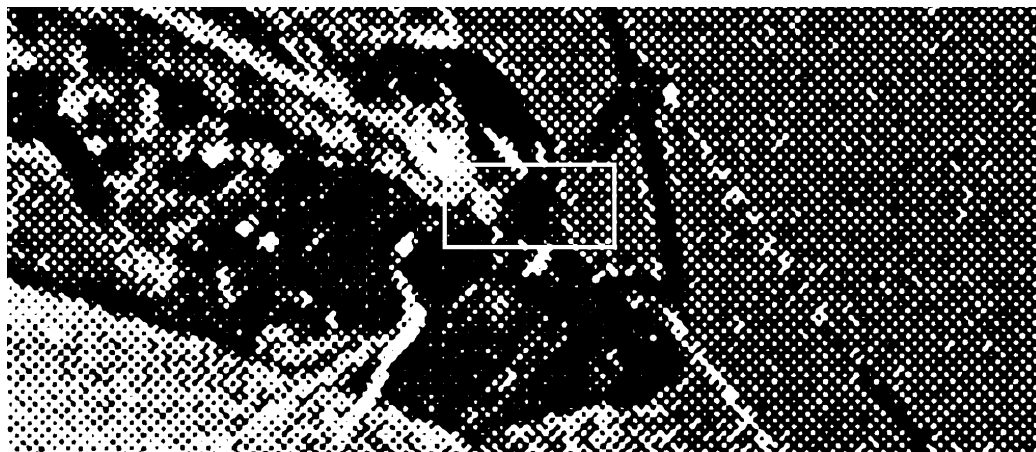
Magnification and Resolution

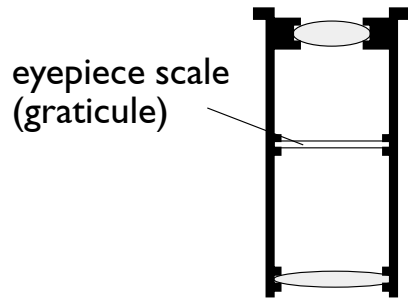
The image is composed of dots.

No amount of **magnification** will reveal any more detail or information ie; nothing more can be **resolved**.

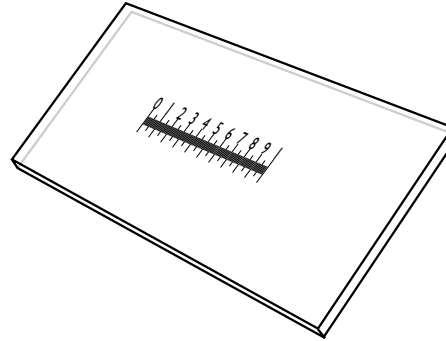
Magnification increases the apparent size of an object.

Resolution is the ability of an optical system to distinguish between adjacent points.

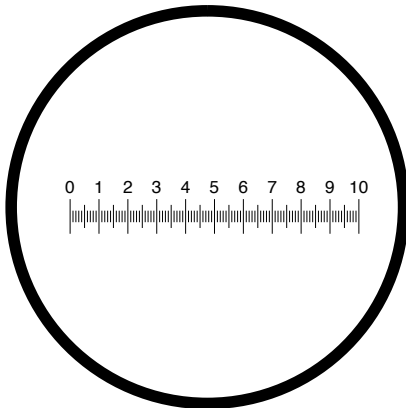




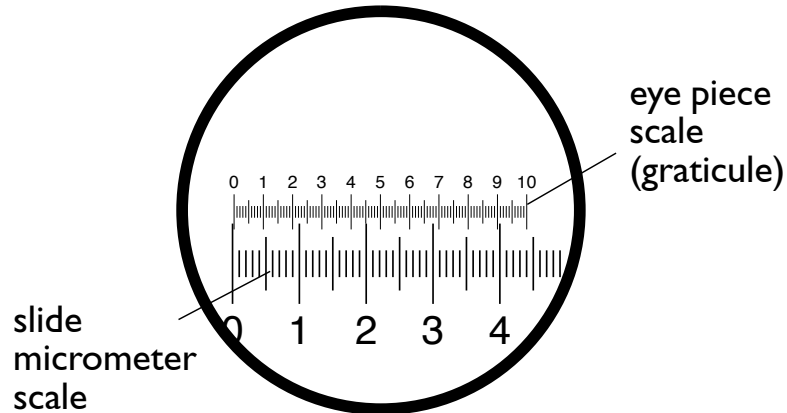
eyepiece scale
(graticule)



Scale in mm etched upon a microscope slide or a
printed acetate sheet (slide micrometer)



Eyepiece scale as seen when
held up to the light away from
the microscope.

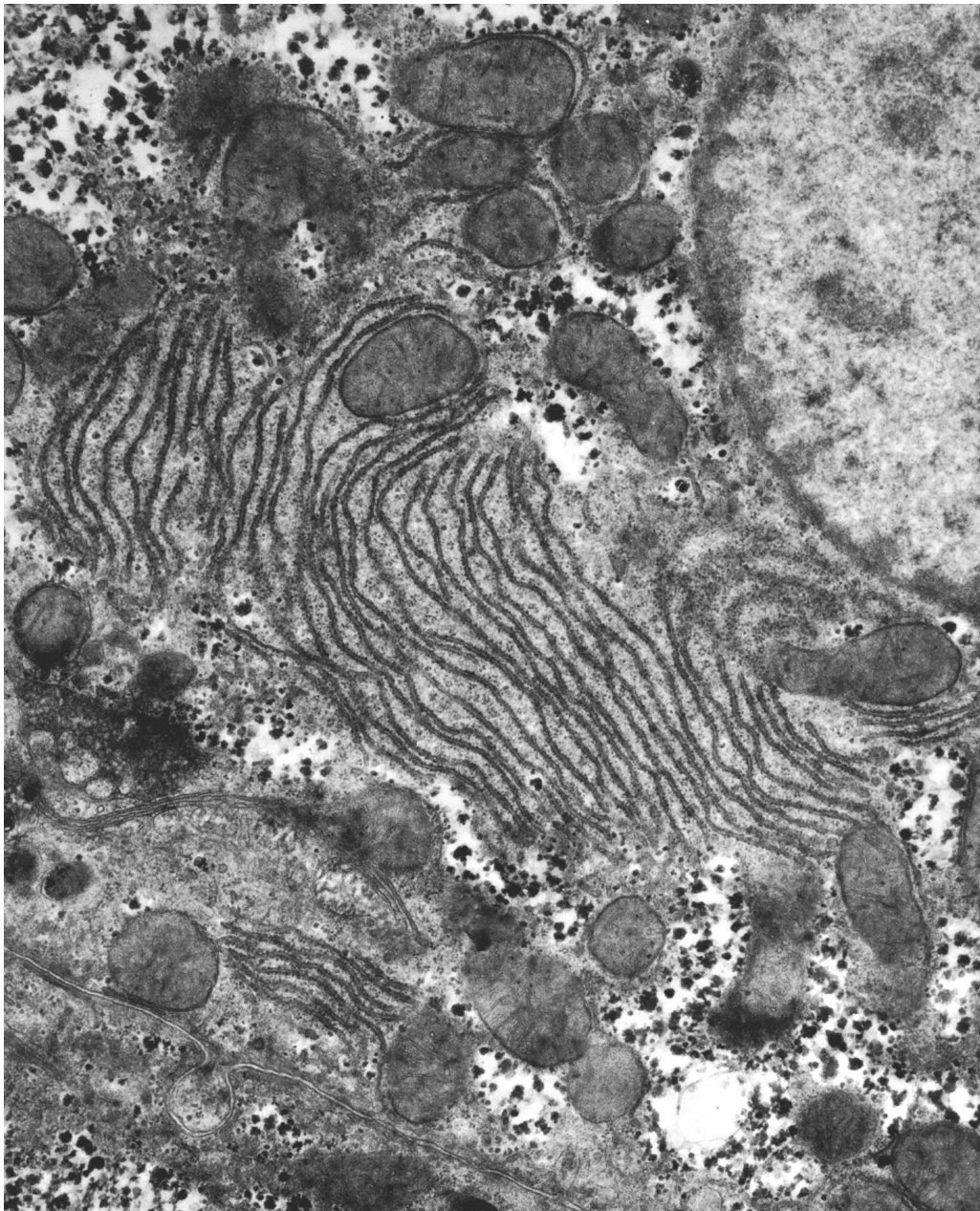


Accurate measurements can be achieved using
the two scales in combination through the
lenses of the microscope

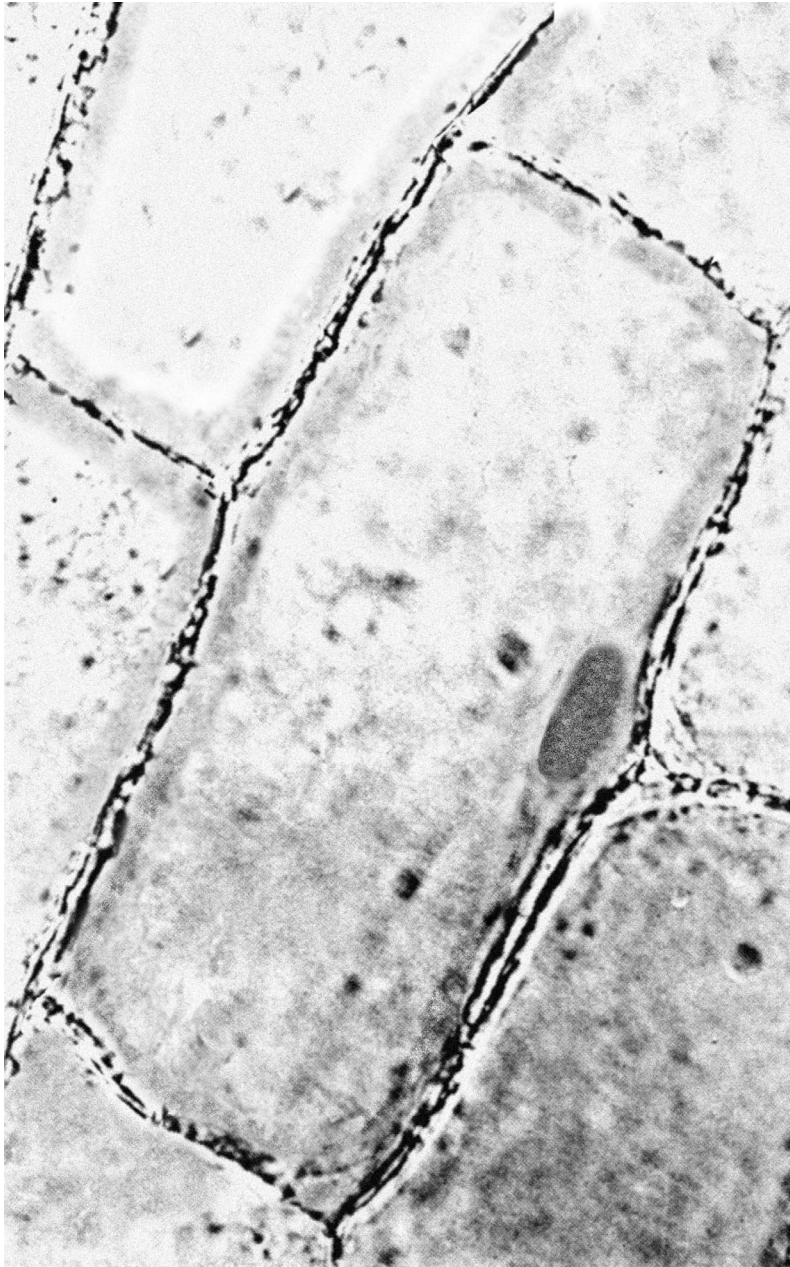
Photomicrograph of human cheek cell



Electron micrograph of human liver cell



Photomicrograph of plant cells



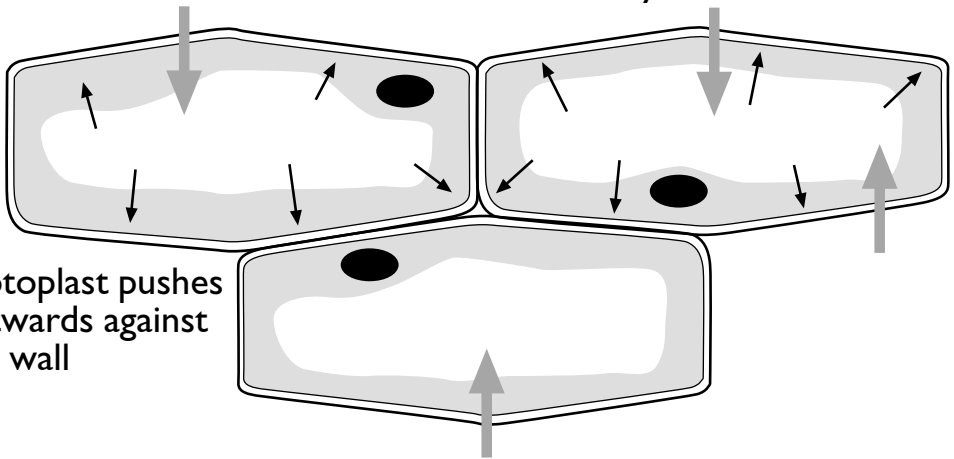
Diagrams of turgid and plasmolysed cells

Turgid Cells

Surrounding solution has lower water potential than protoplast

Water taken in by osmosis

Protoplast pushes outwards against cell wall

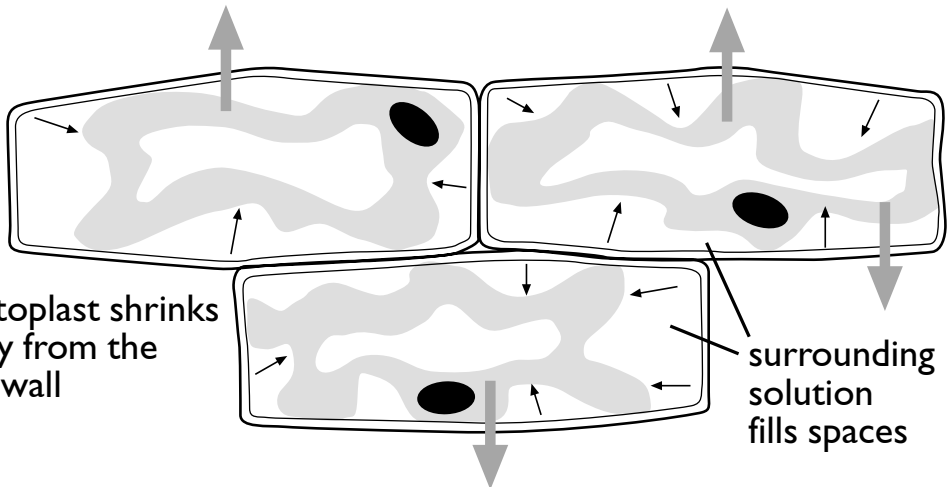


Plasmolysed Cells

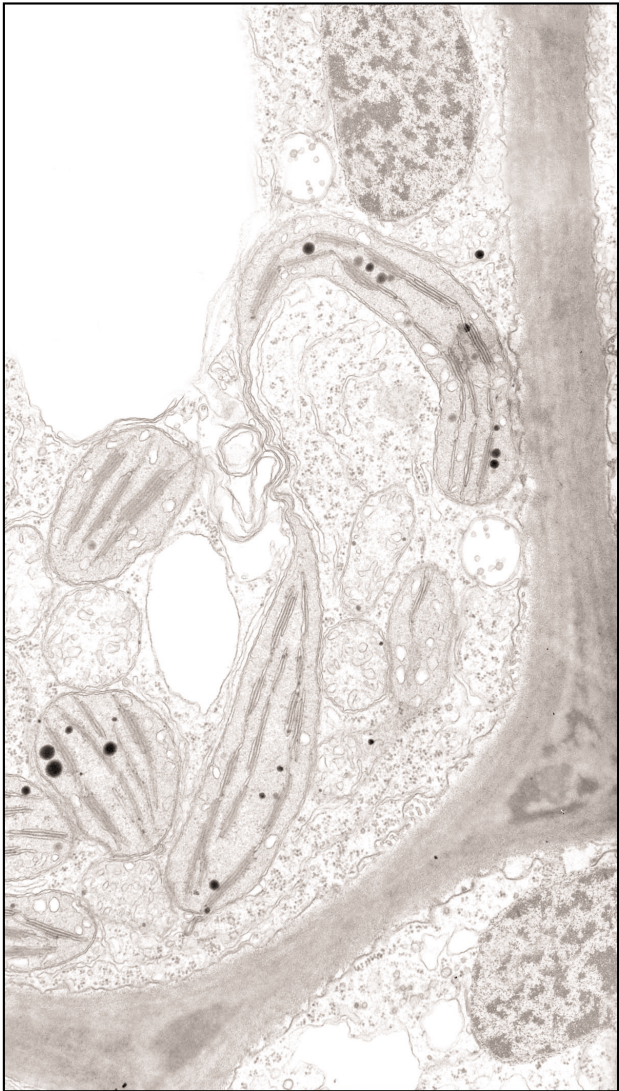
Surrounding solution has higher water potential than protoplast

Water lost by osmosis

Protoplast shrinks away from the cell wall



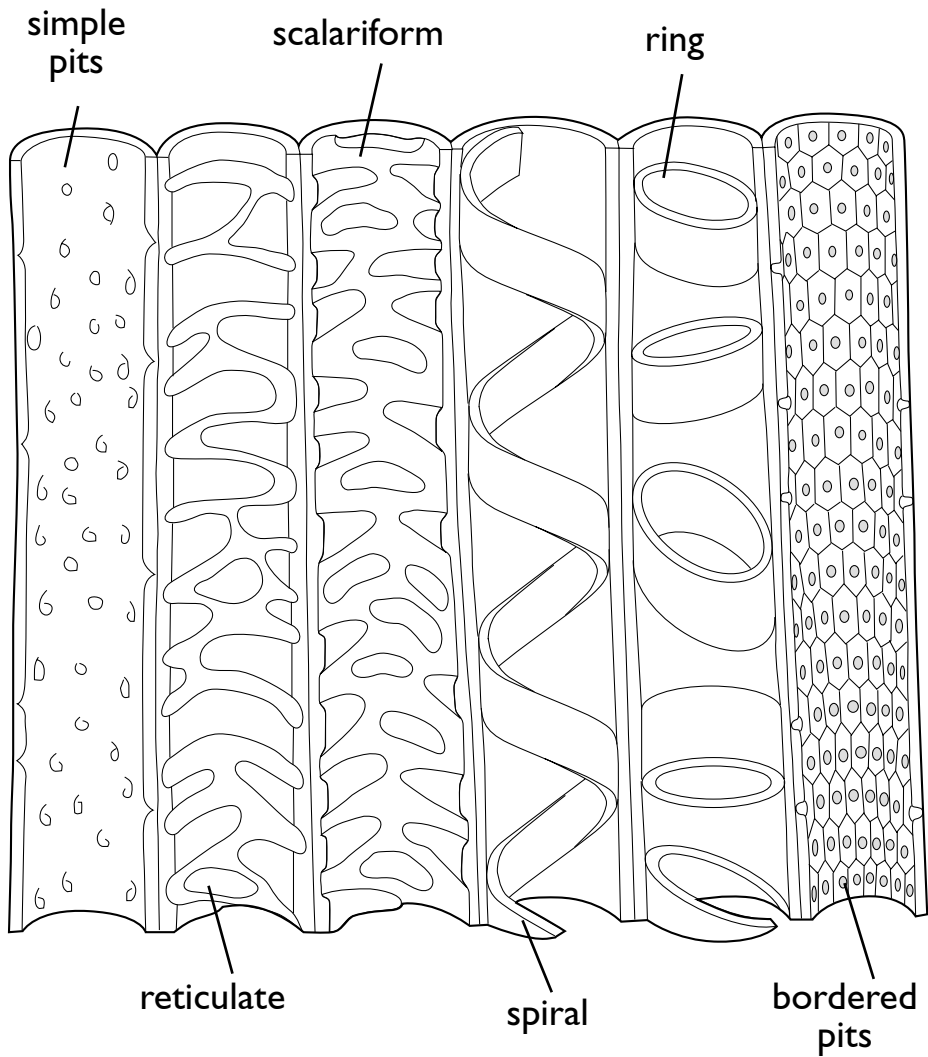
Electronmicrograph of plant cell



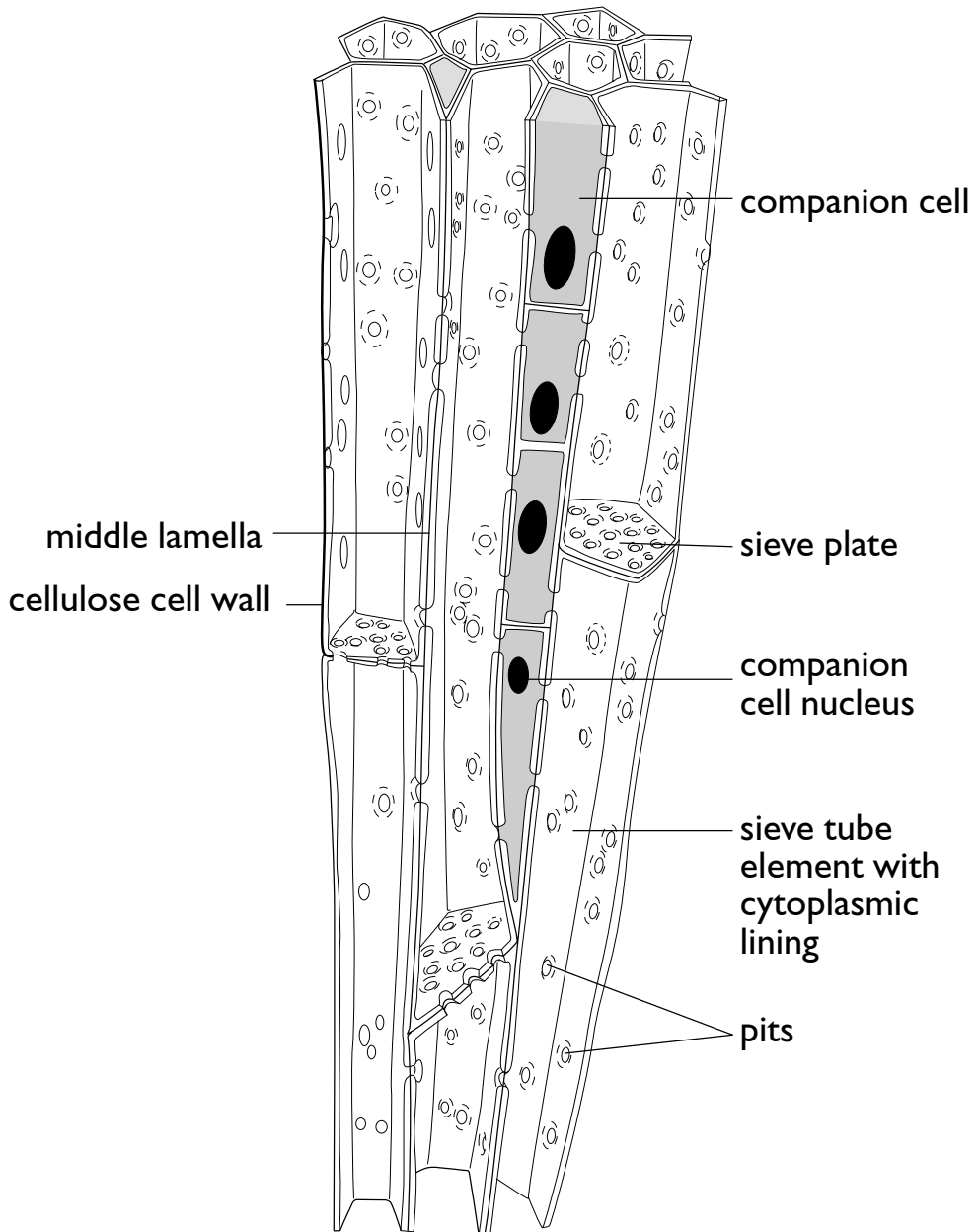
PLANT CELLS

Structure of vessels in xylem

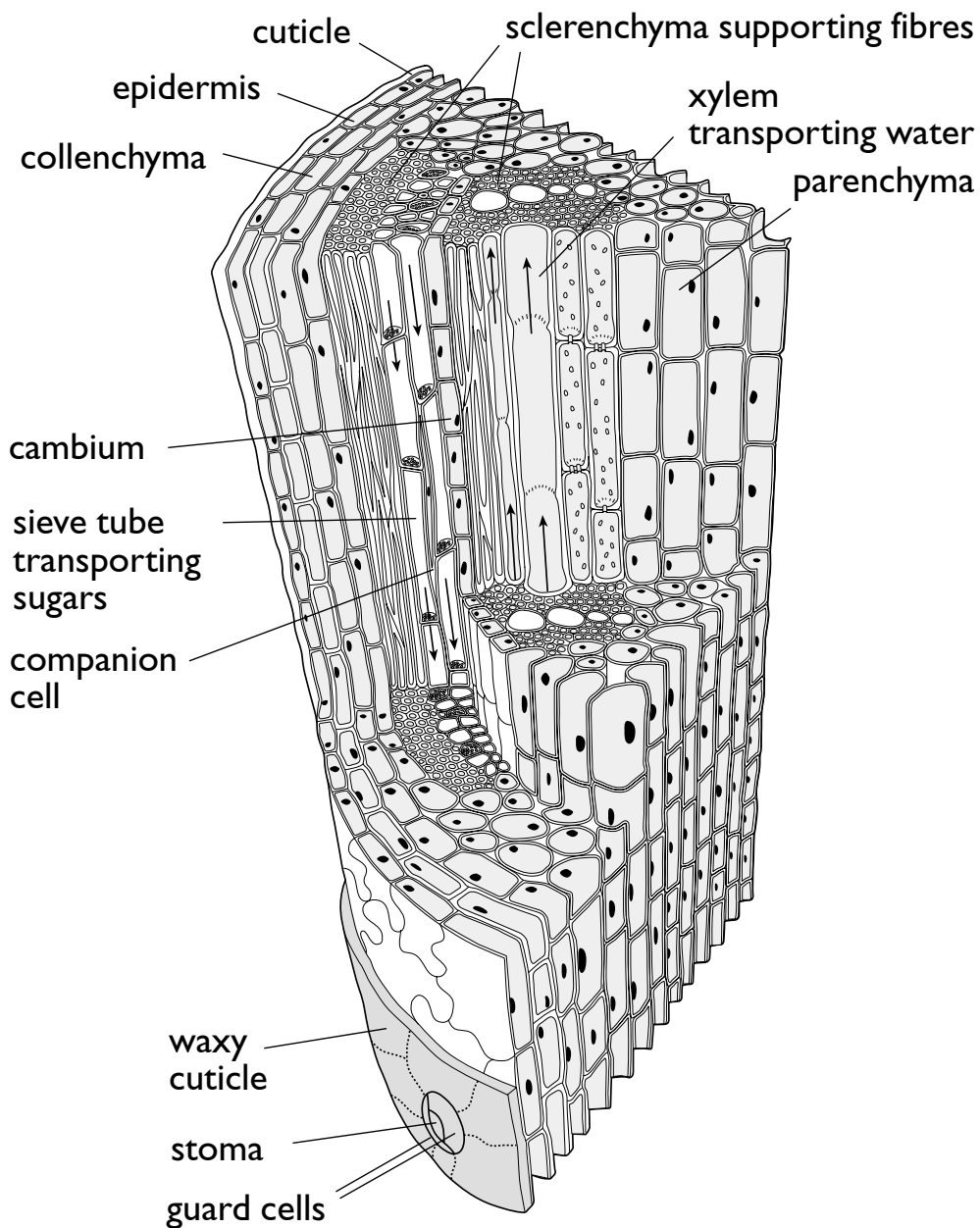
Xylem vessels showing different types of lignified thickening

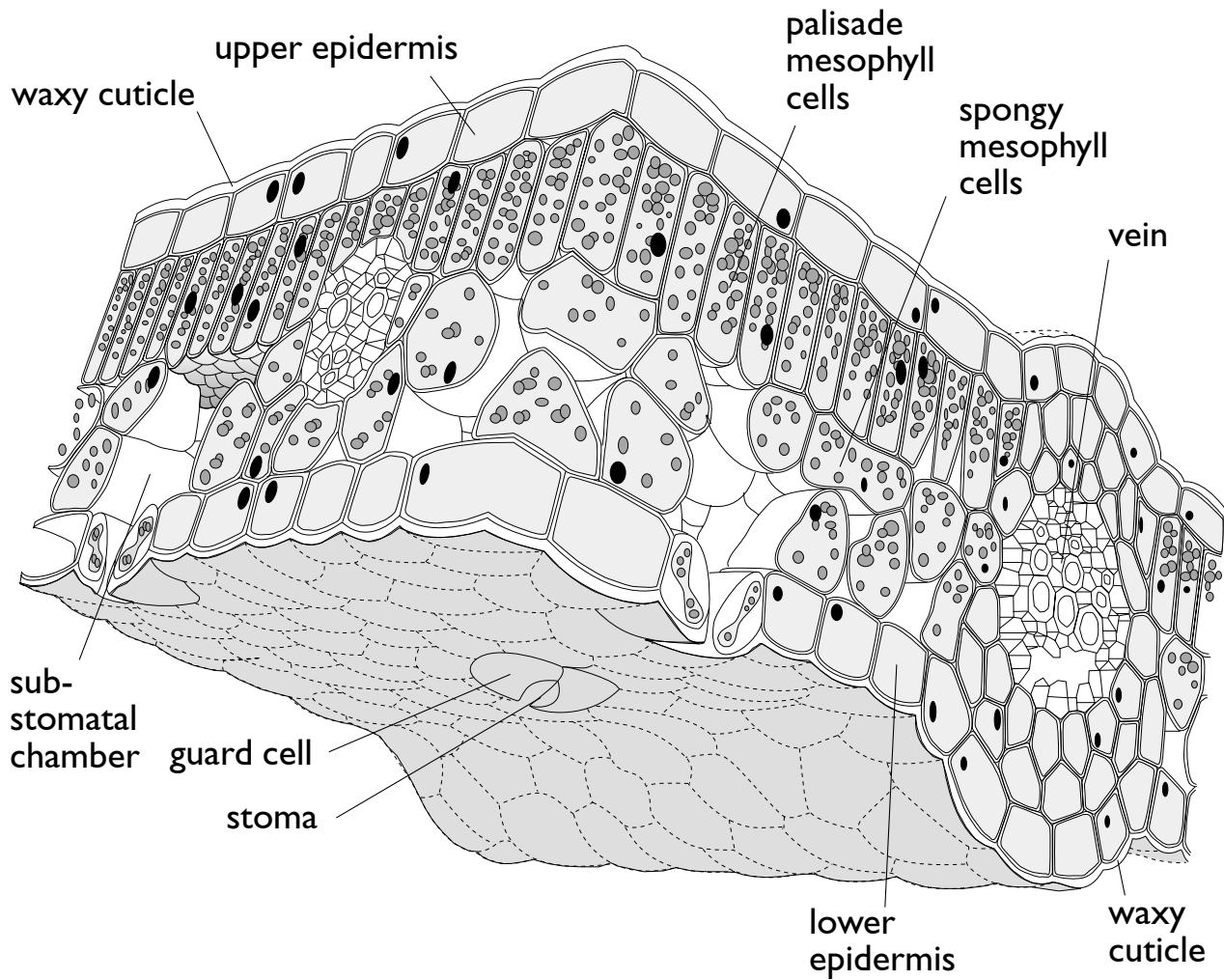


Structure of sieve tube elements and companion cells in phloem



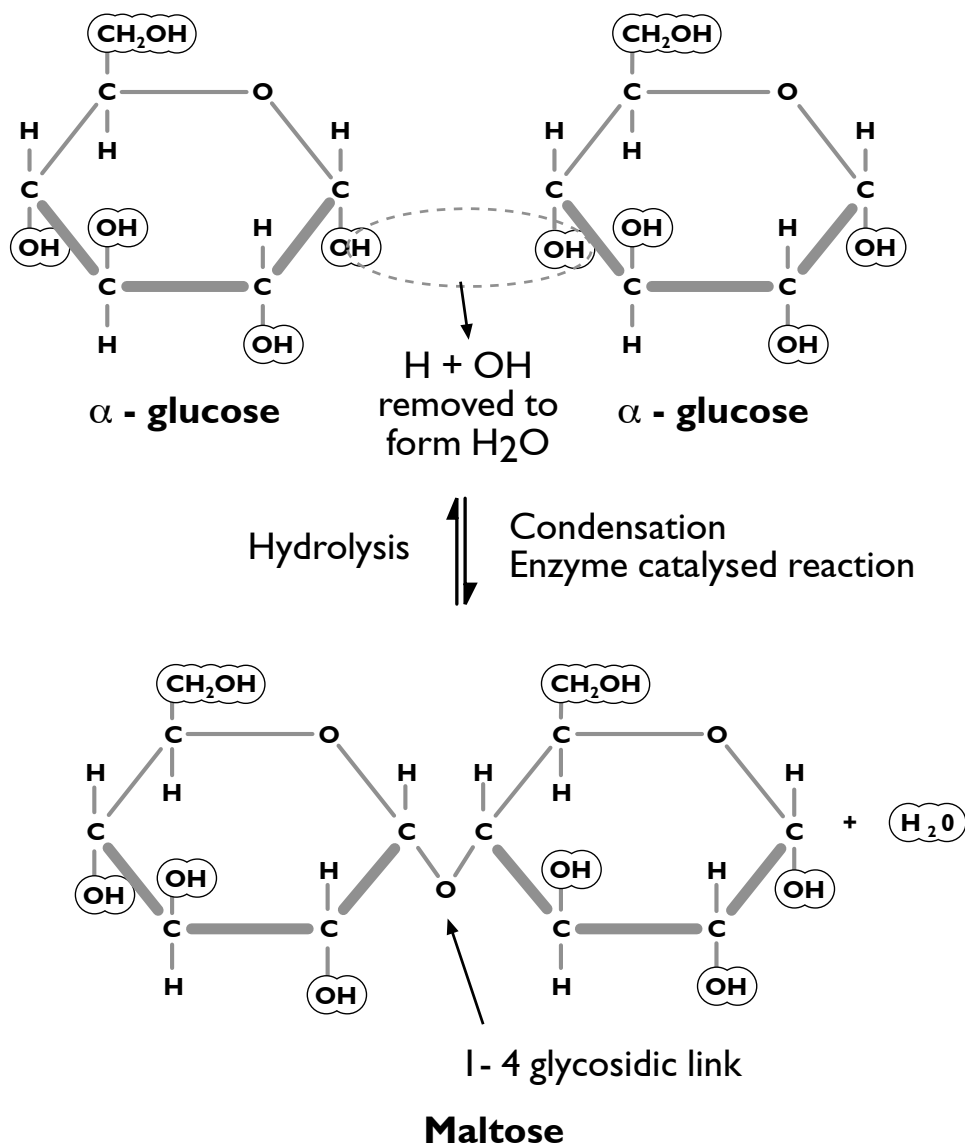
Xylem and phloem T.S. and L.S.





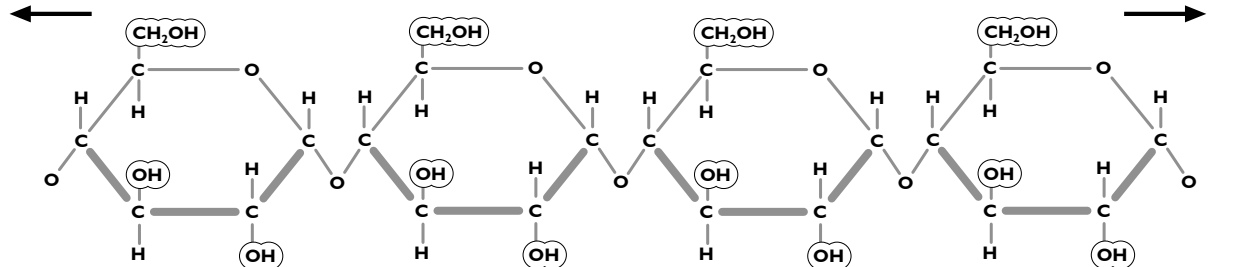
MOLECULAR STRUCTURE OF THE CELL

Monosaccharides and disaccharides

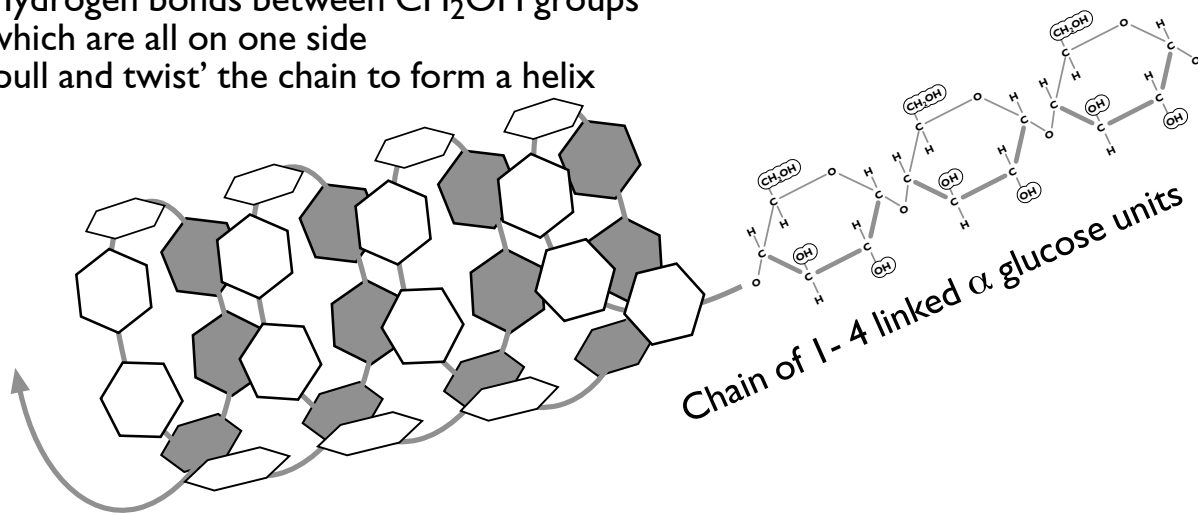


Part of amylose molecule chain

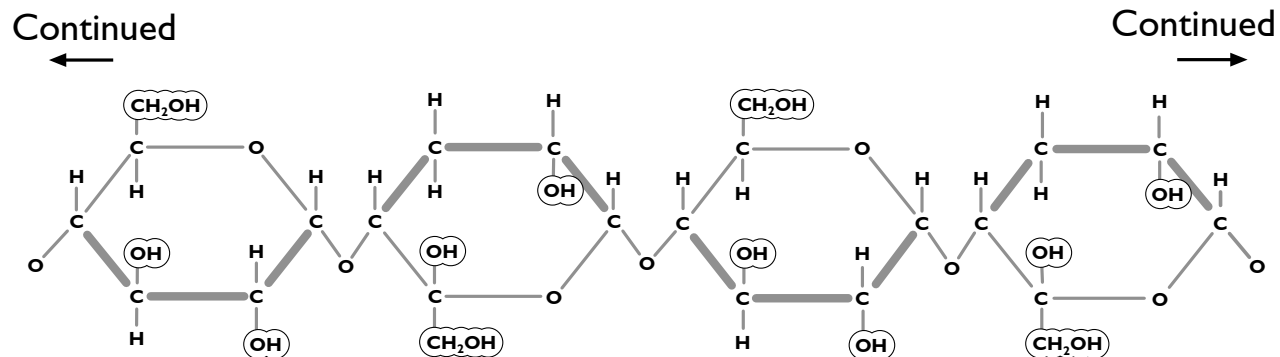
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Hydrogen bonds between CH₂OH groups which are all on one side
'pull and twist' the chain to form a helix

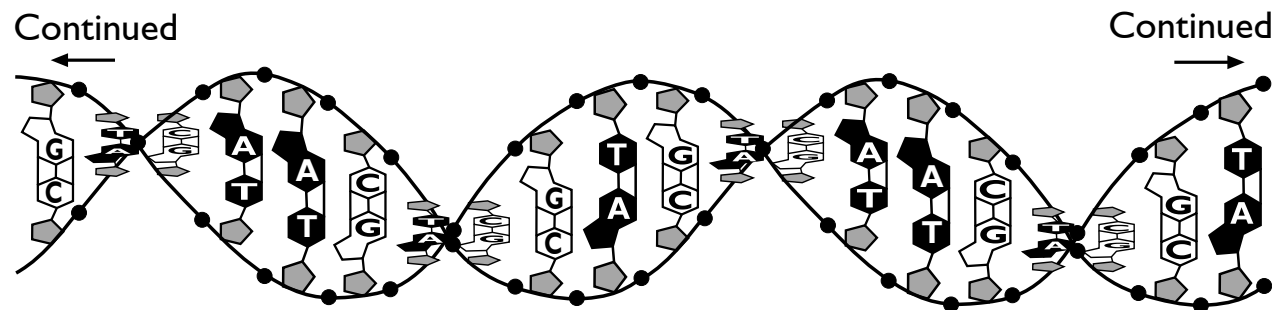


Part of a cellulose molecule chain

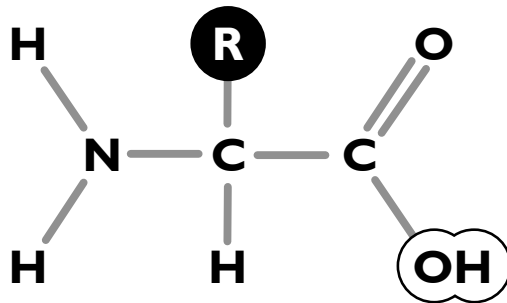


Notice how the CH_2OH groups alternate from side to side of the chain (the bonds indicated by a thick line are nearer)

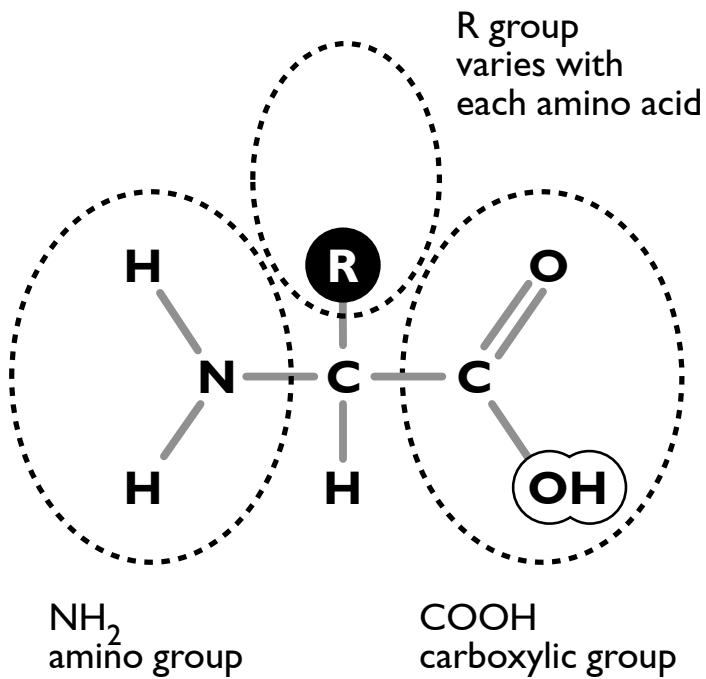
Part of a DNA double helix



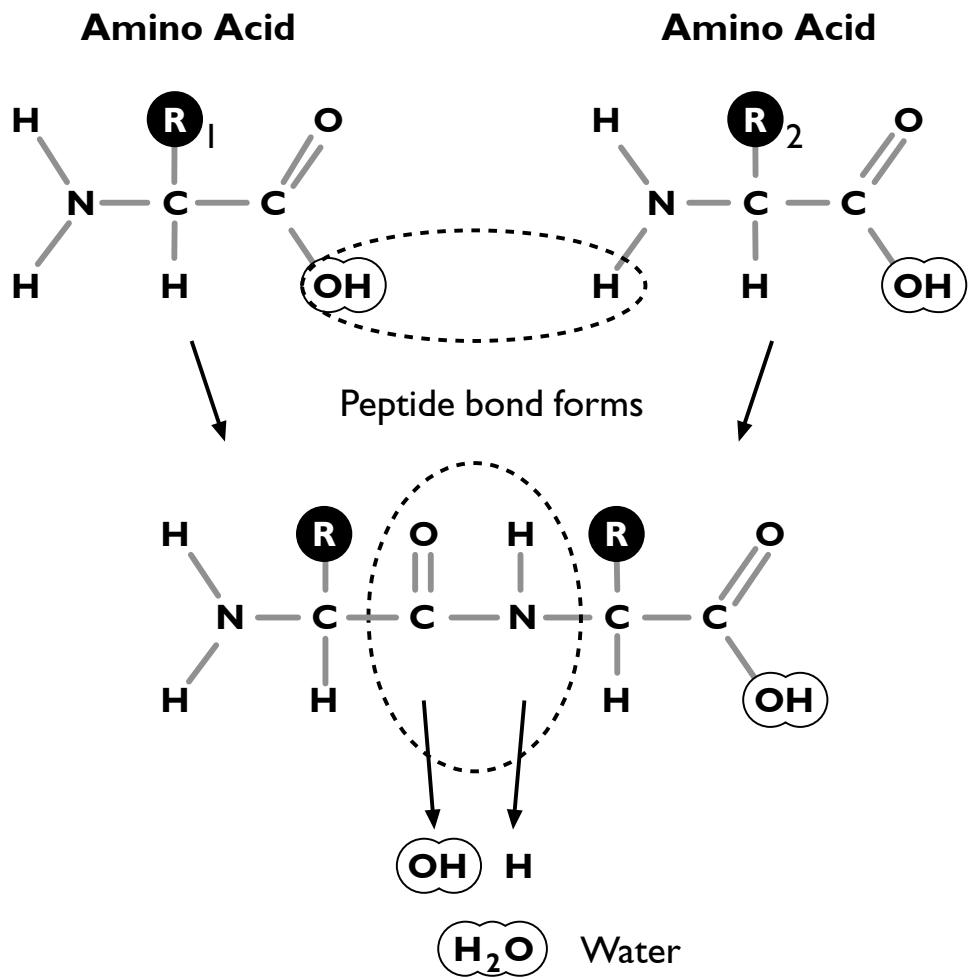
Amino acid structure



Amino Acid



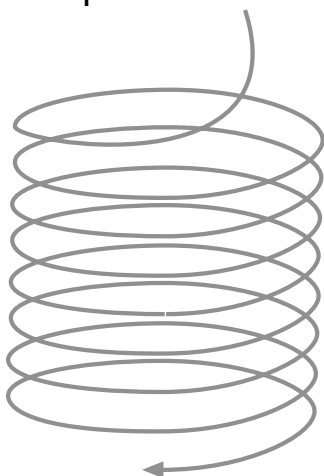
Amino acid structure and peptide bond



Secondary and tertiary structures of proteins

Secondary structure of proteins

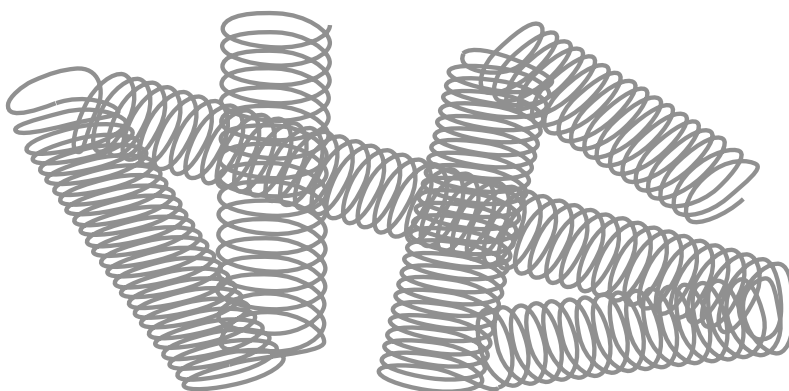
In an alpha helix hydrogen bonds 'pull' molecule chain into a spiral structure



In a beta sheet hydrogen bonds hold and align molecule chains side by side. Angle of bonds in each chain are as a consequence perfectly aligned forming 'pleats'.

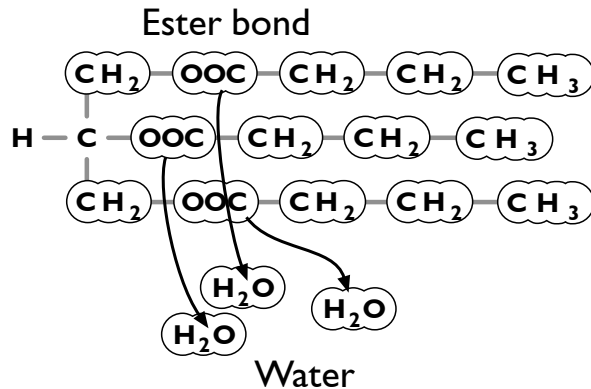
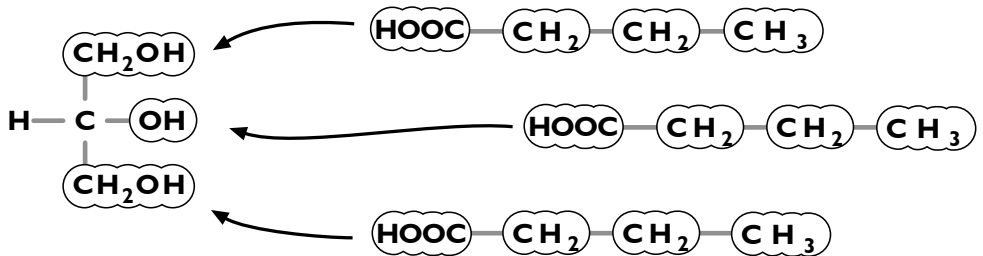


Tertiary structure of proteins

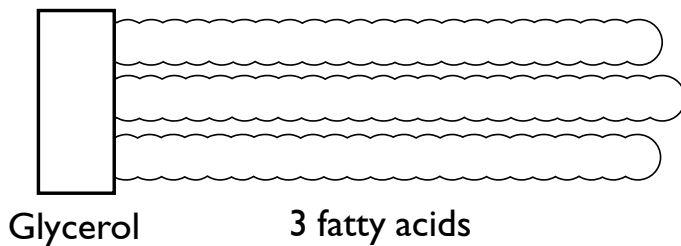


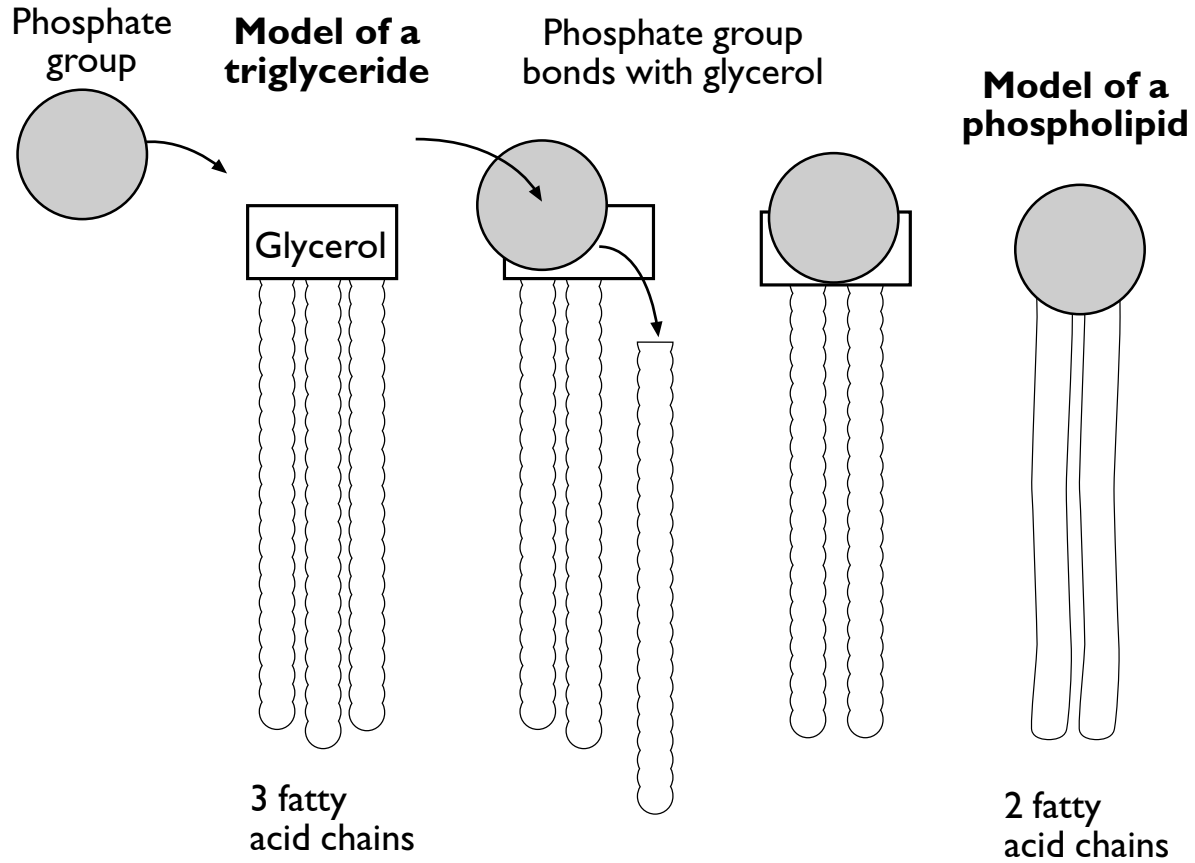
The alpha helix chain folds around itself forming a third level of structural organisation, just like a tangled telephone flex

Structure of triglyceride

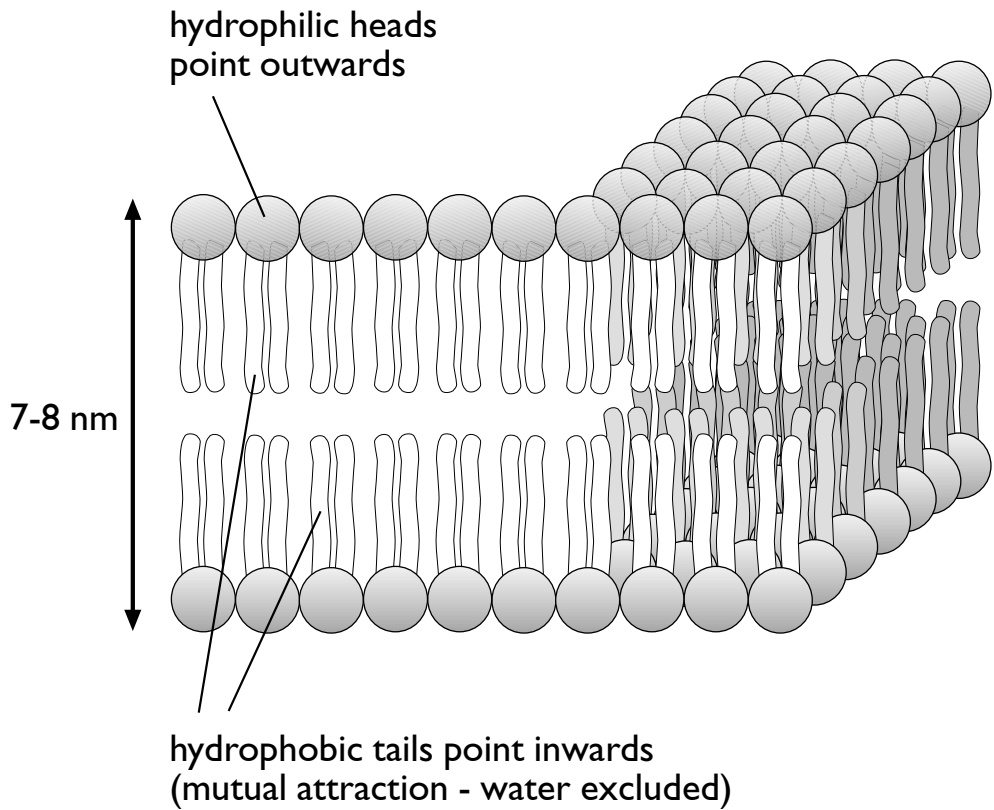


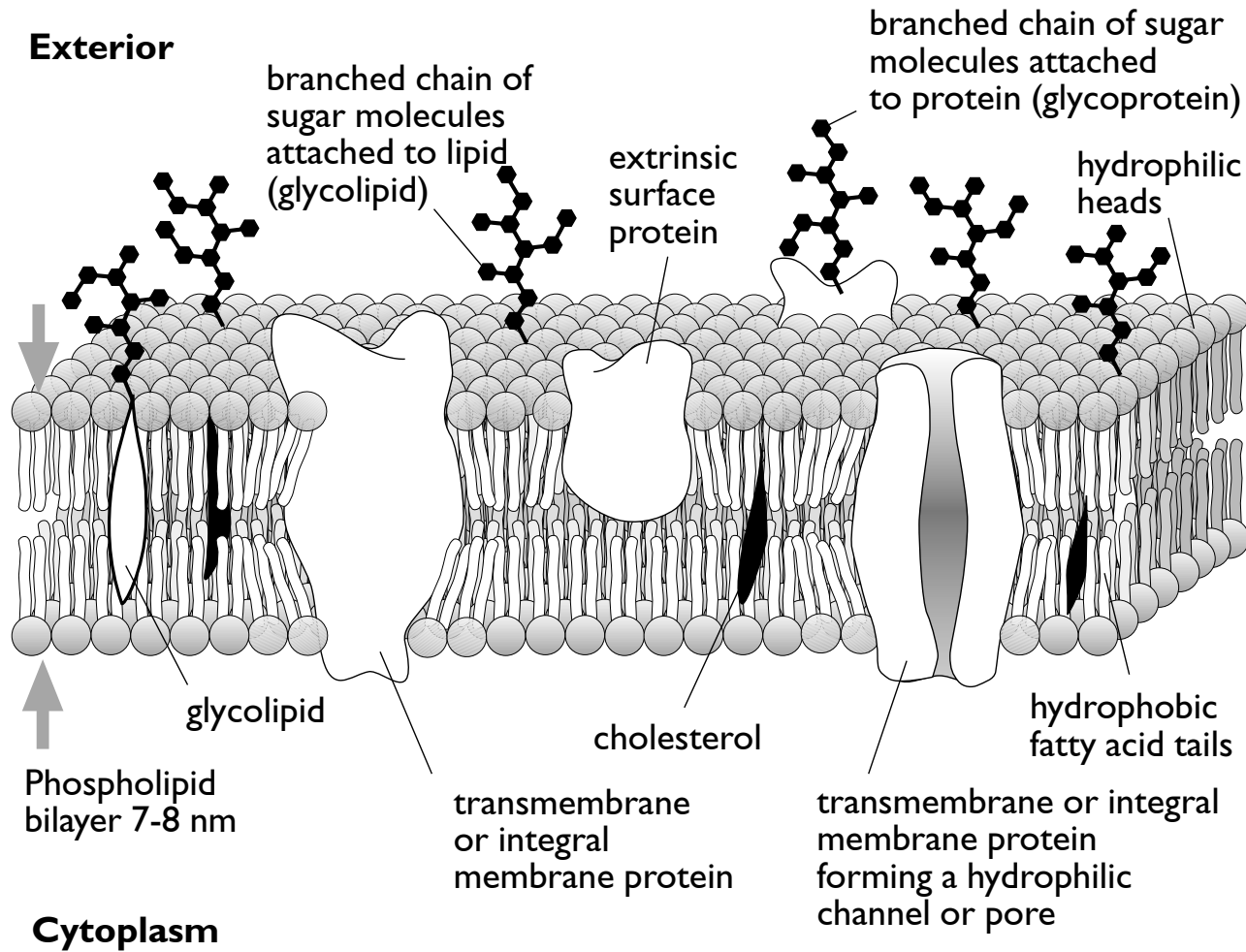
Model of a triglyceride



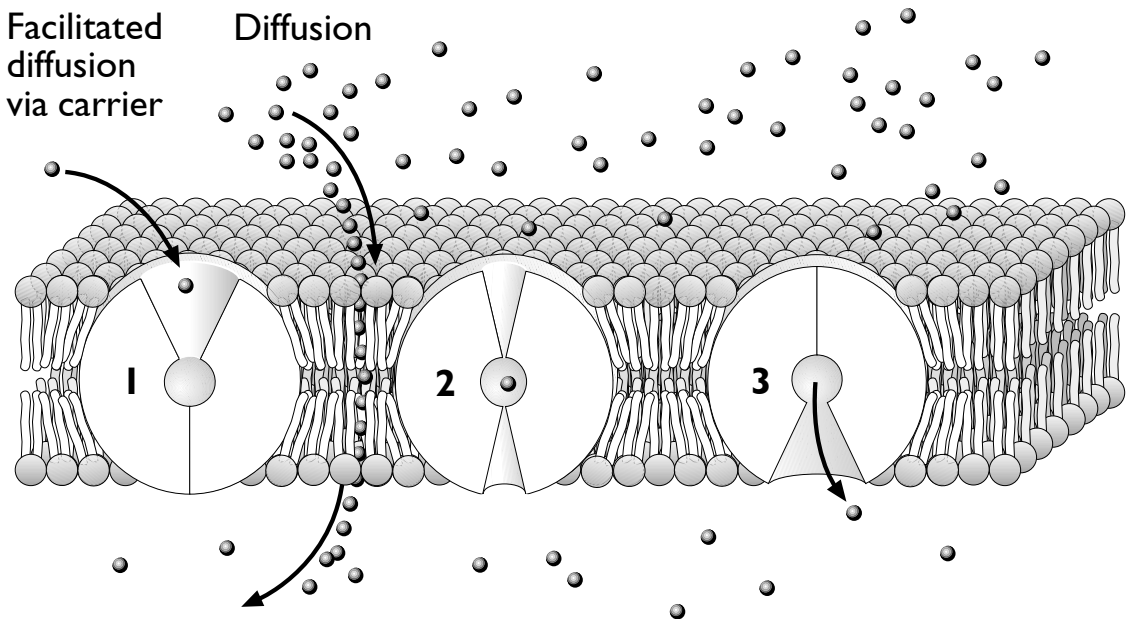


Phospholipids and the bilayer

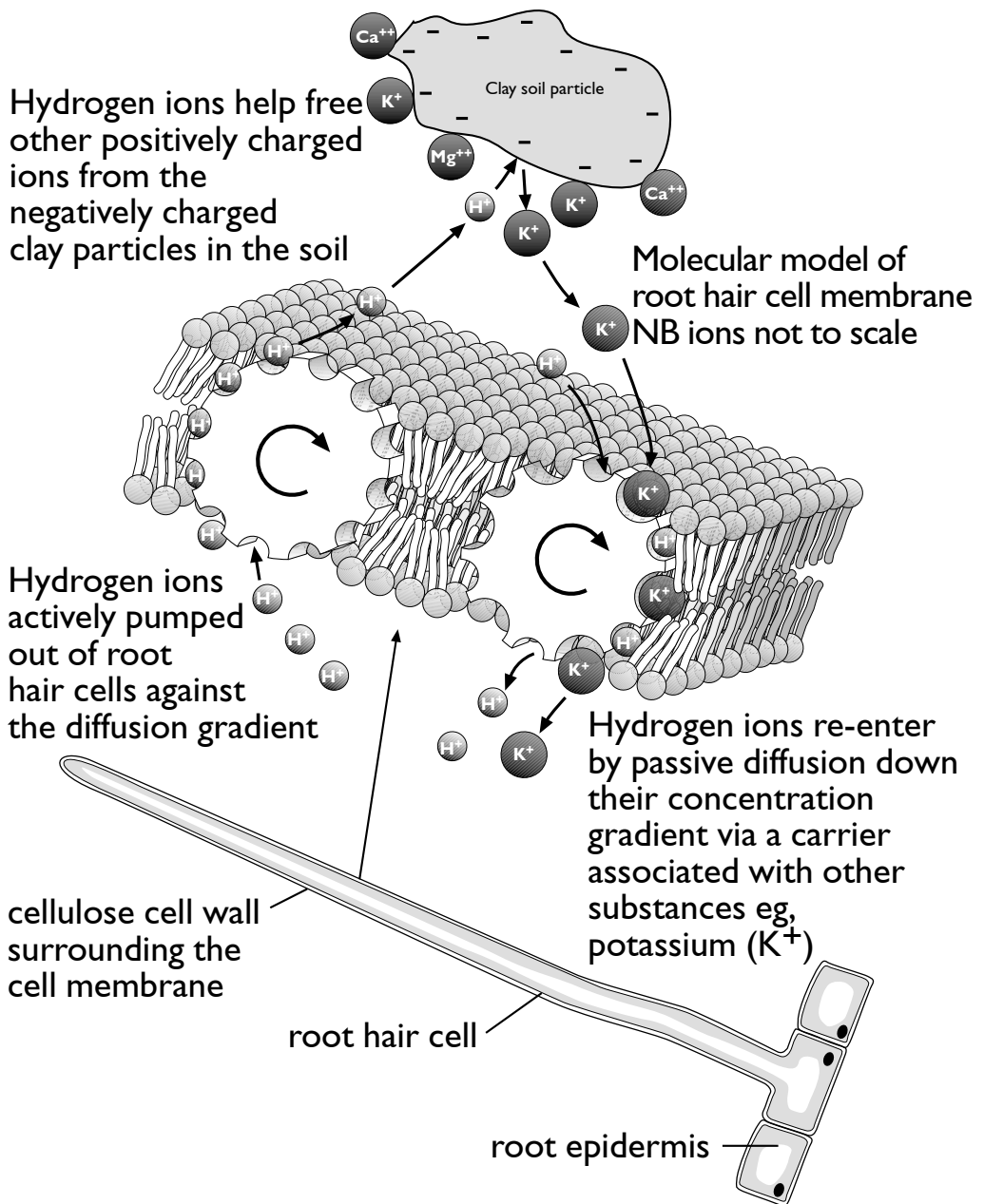




Diffusion and facilitated diffusion

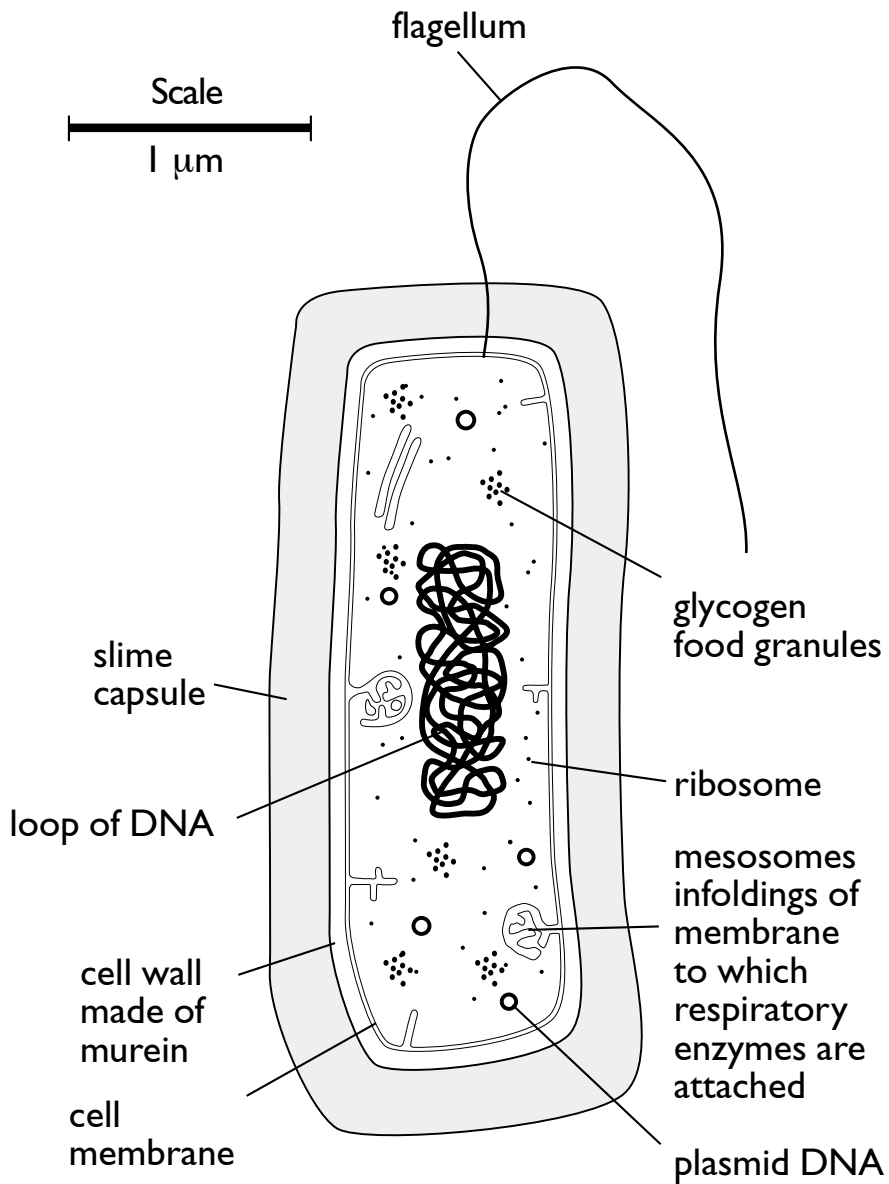


Cation exchange by root hairs



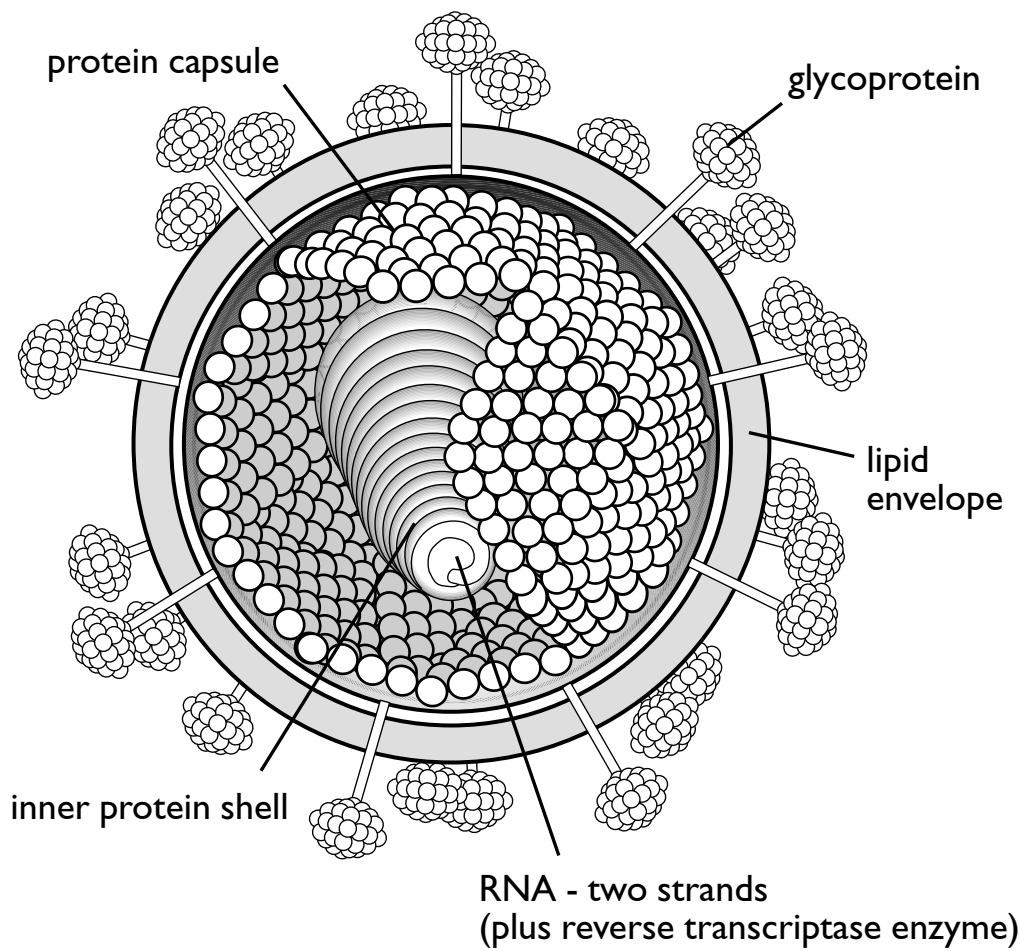
Cellular Defence Against Disease

Structure of bacterium

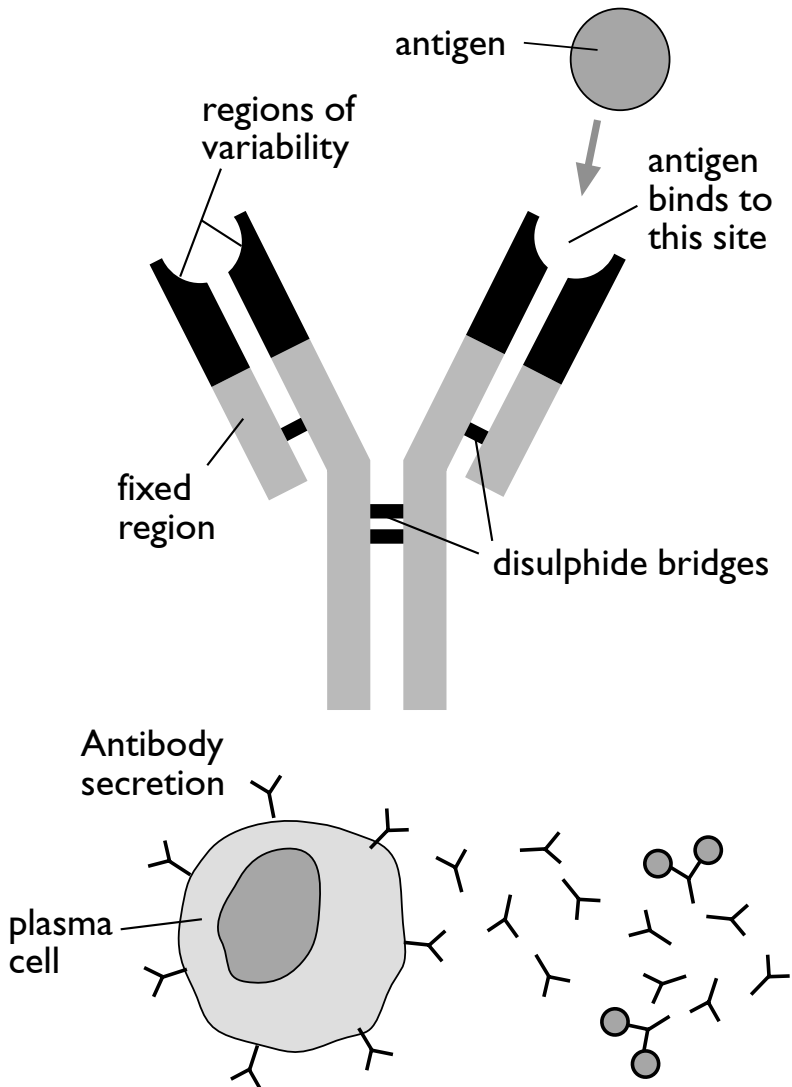


HIV virus

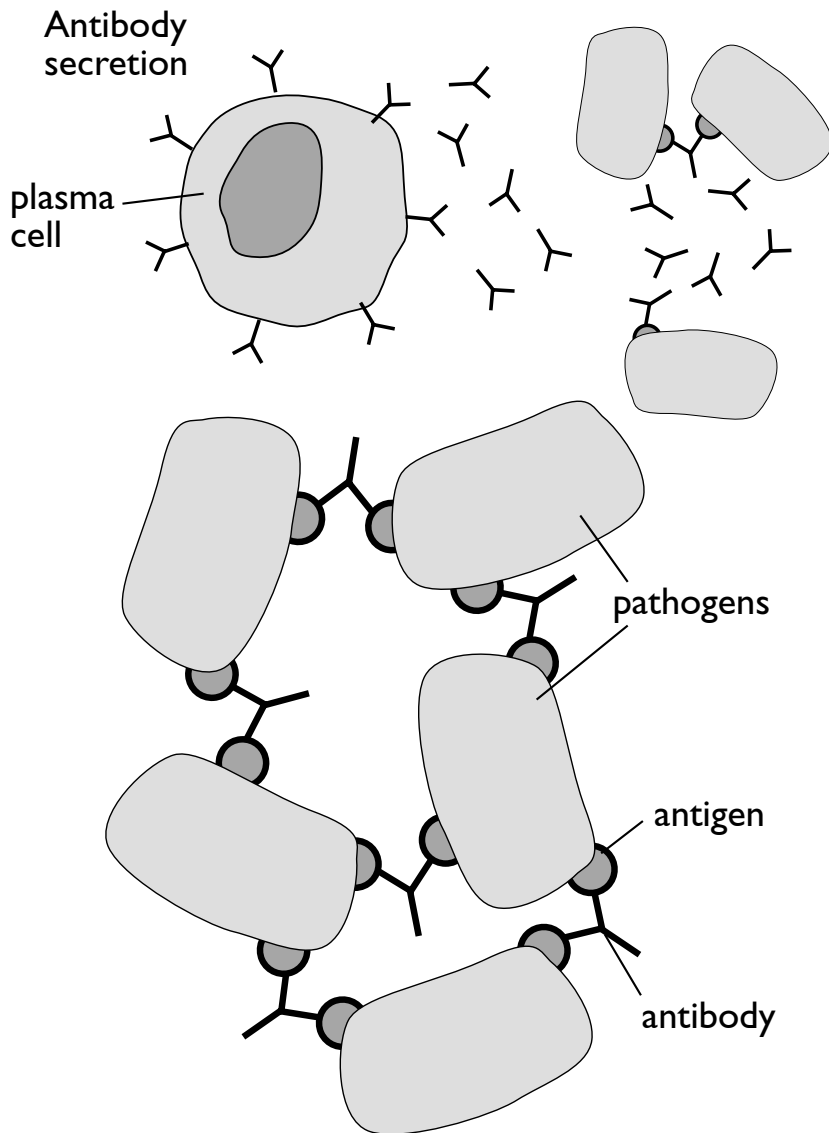
Human Immunodeficiency Virus



Antibody structure



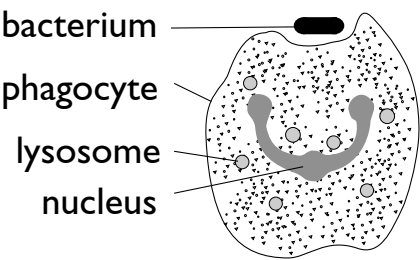
Antibodies bind pathogens together



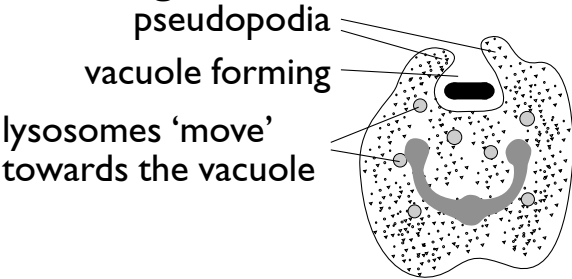
Pathogens trapped ready for phagocytosis

Phagocytosis

Phagocyte ‘moves’ towards bacterium

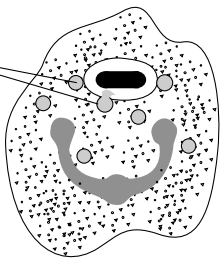


Vacuole forming

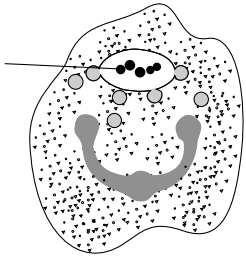


Vacuole formed

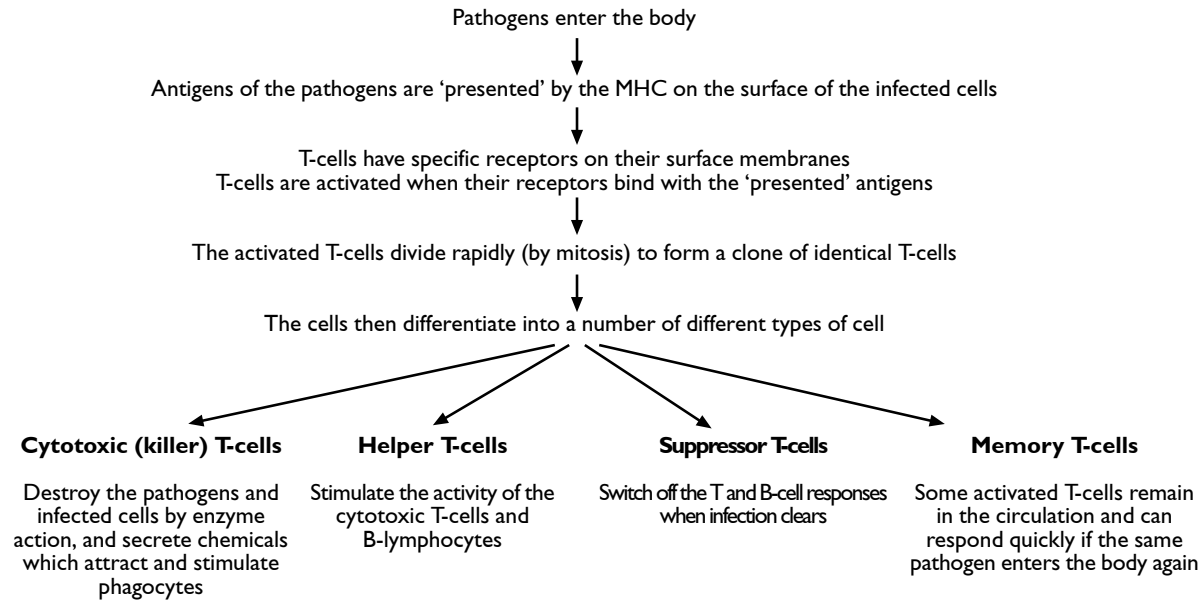
lysosomes collect around the vacuole fuse with it releasing digestive enzymes

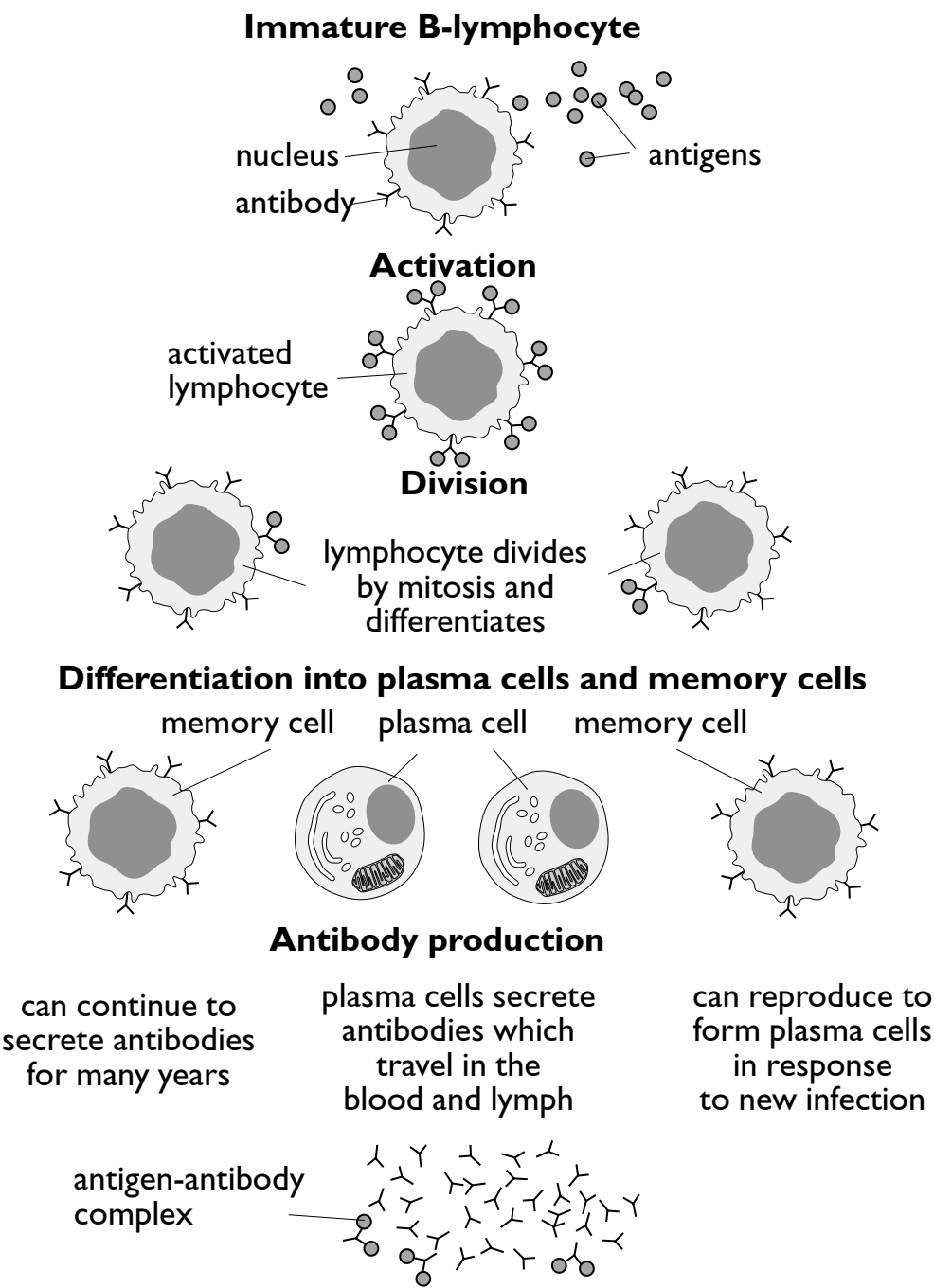


bacterium digested and products absorbed



Cellular response to infection - T-lymphocytes (T-cells)





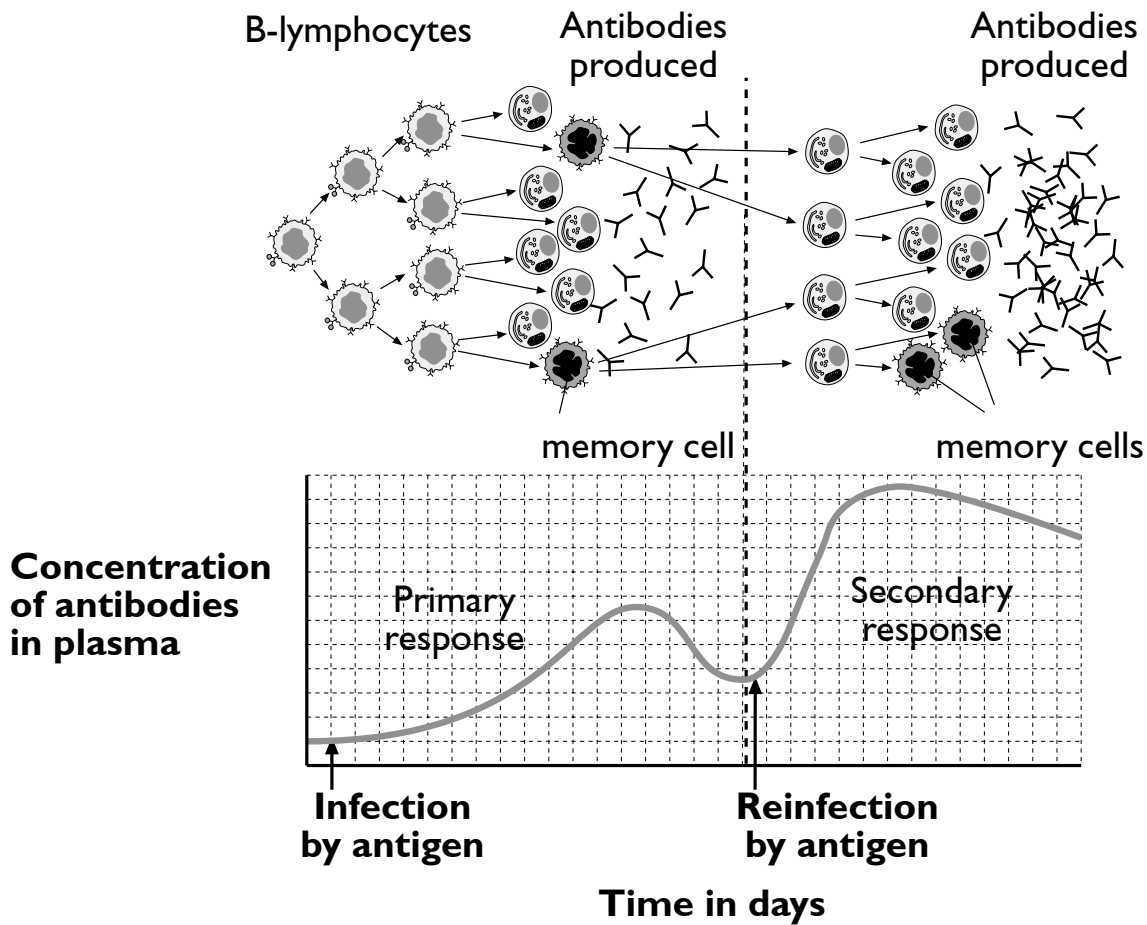
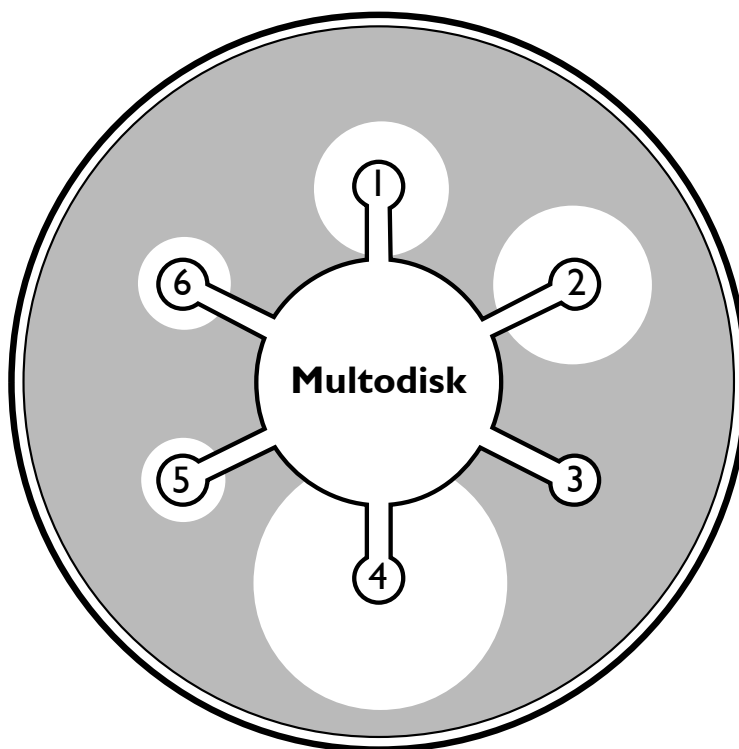
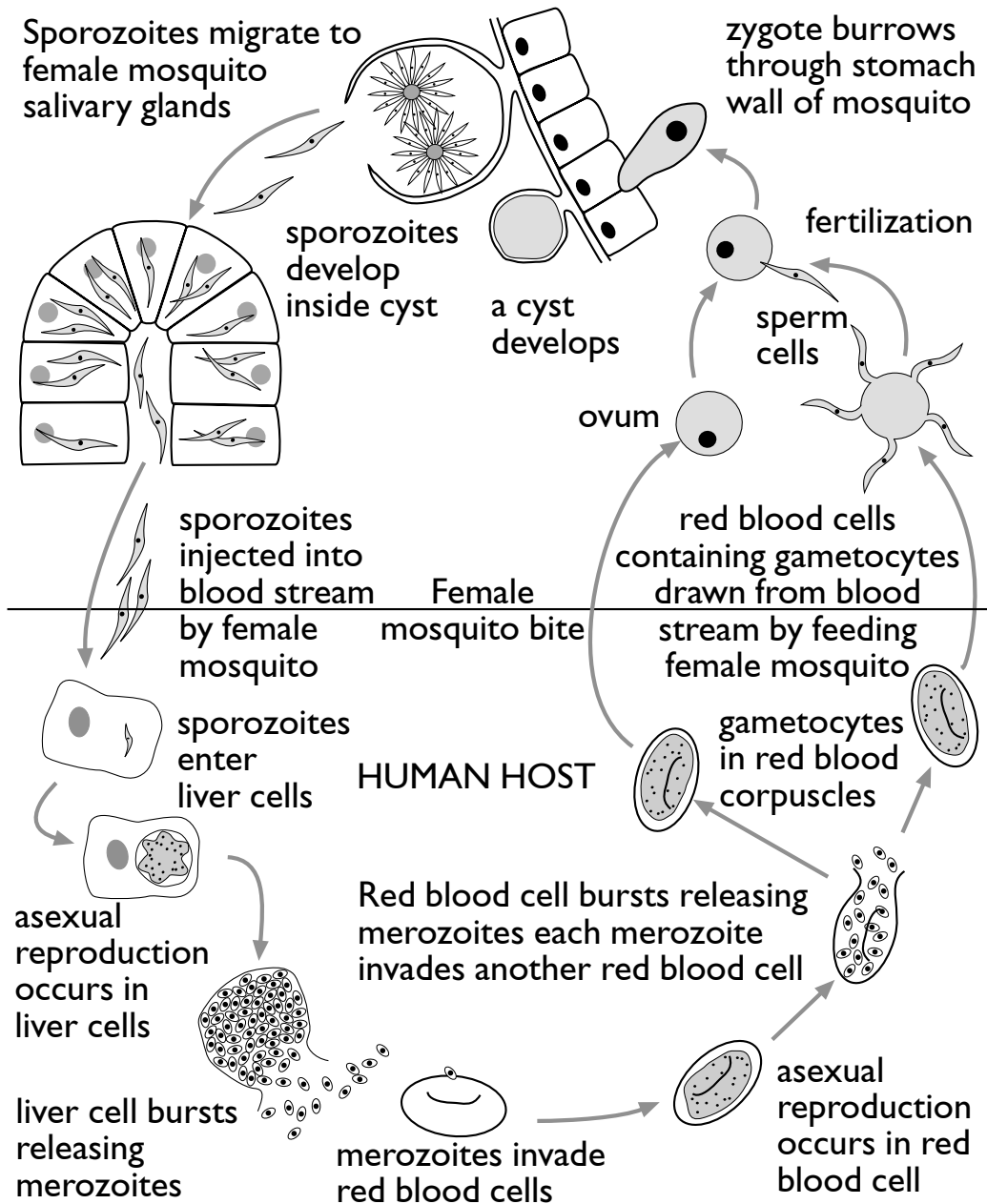


Diagram to show action of specific antibiotics on a bacterial culture



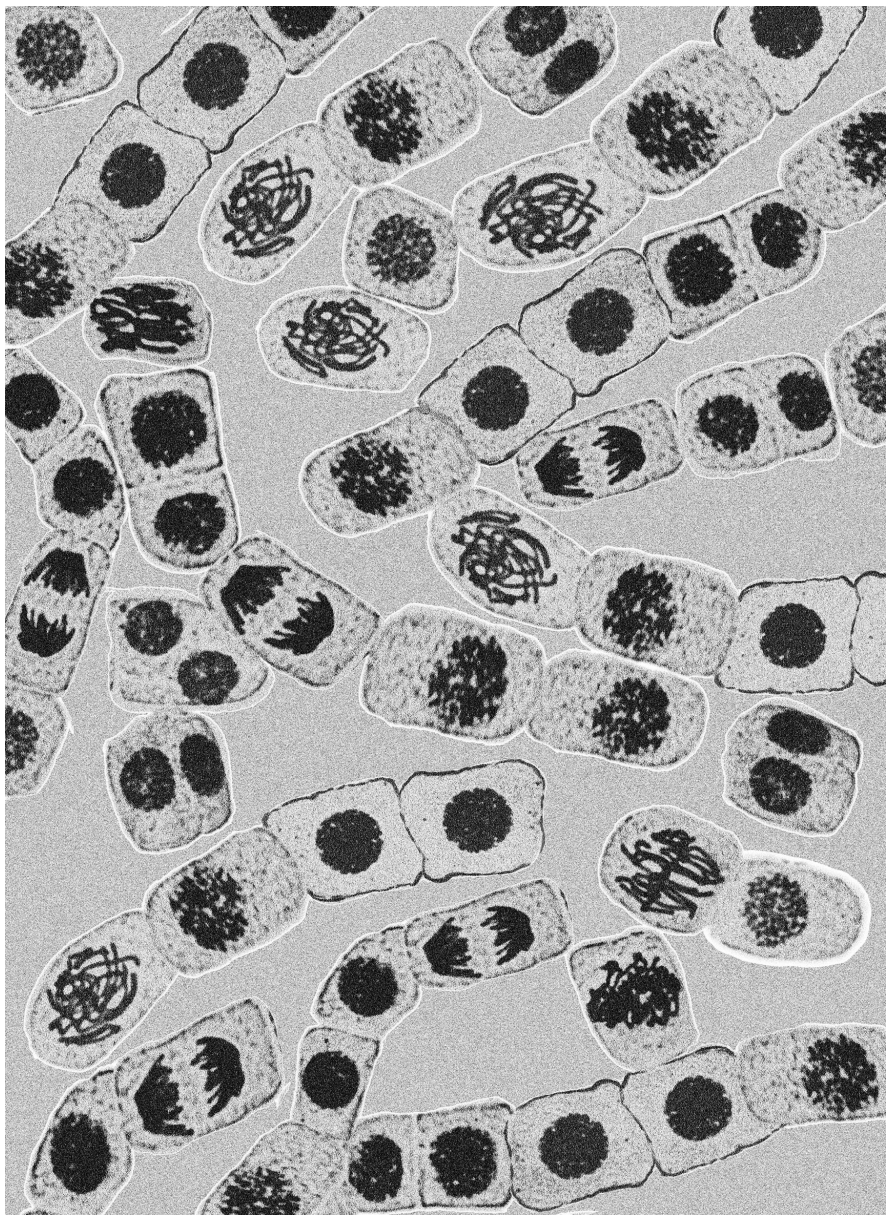
- 1 Tetracycline
- 2 Chloraphenol
- 3 Erythromycin
- 4 Sulphafurazole
- 5 Penicillin G
- 6 Streptomycin

Life cycle of Plasmodium

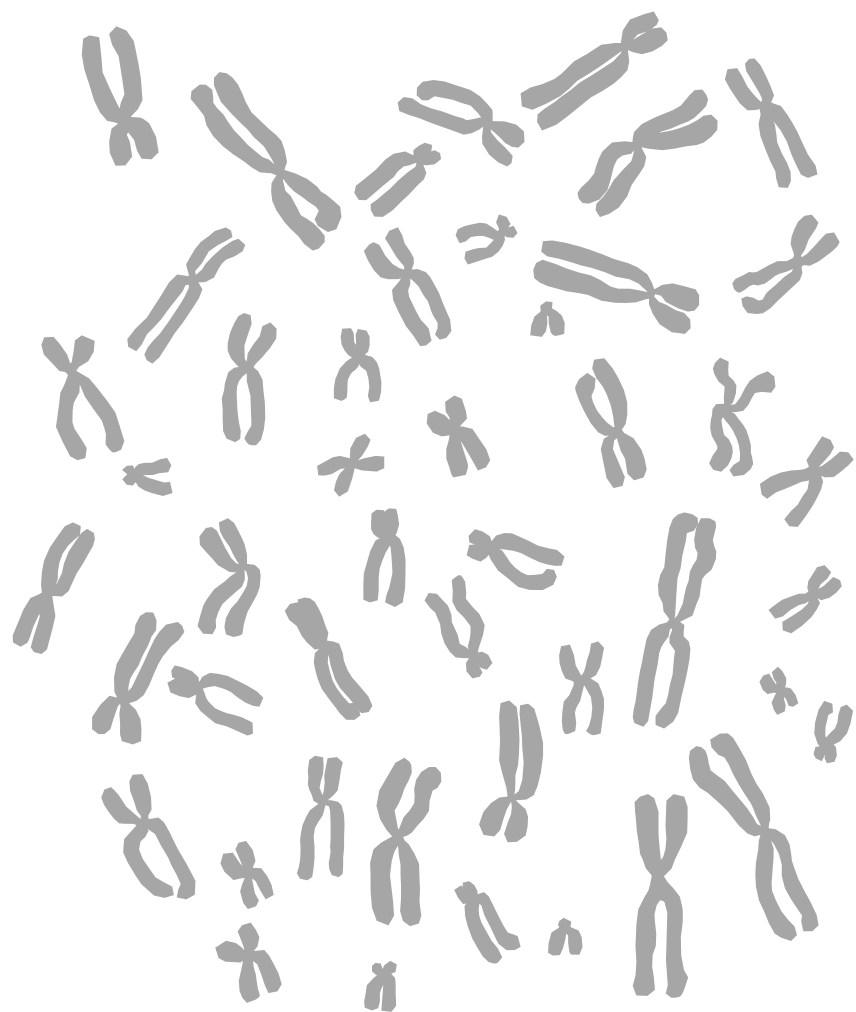


THE NUCLEUS AND NUCLEIC ACIDS

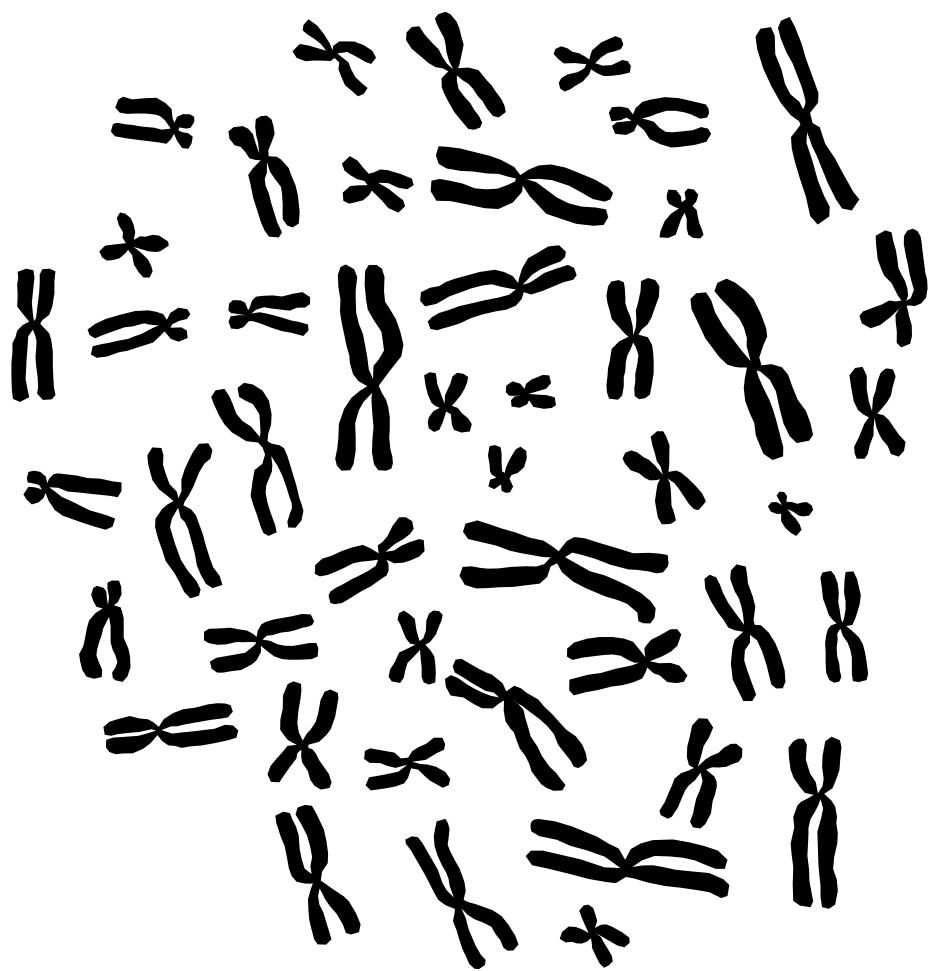
Root tip squash



Normal human karyotype - A

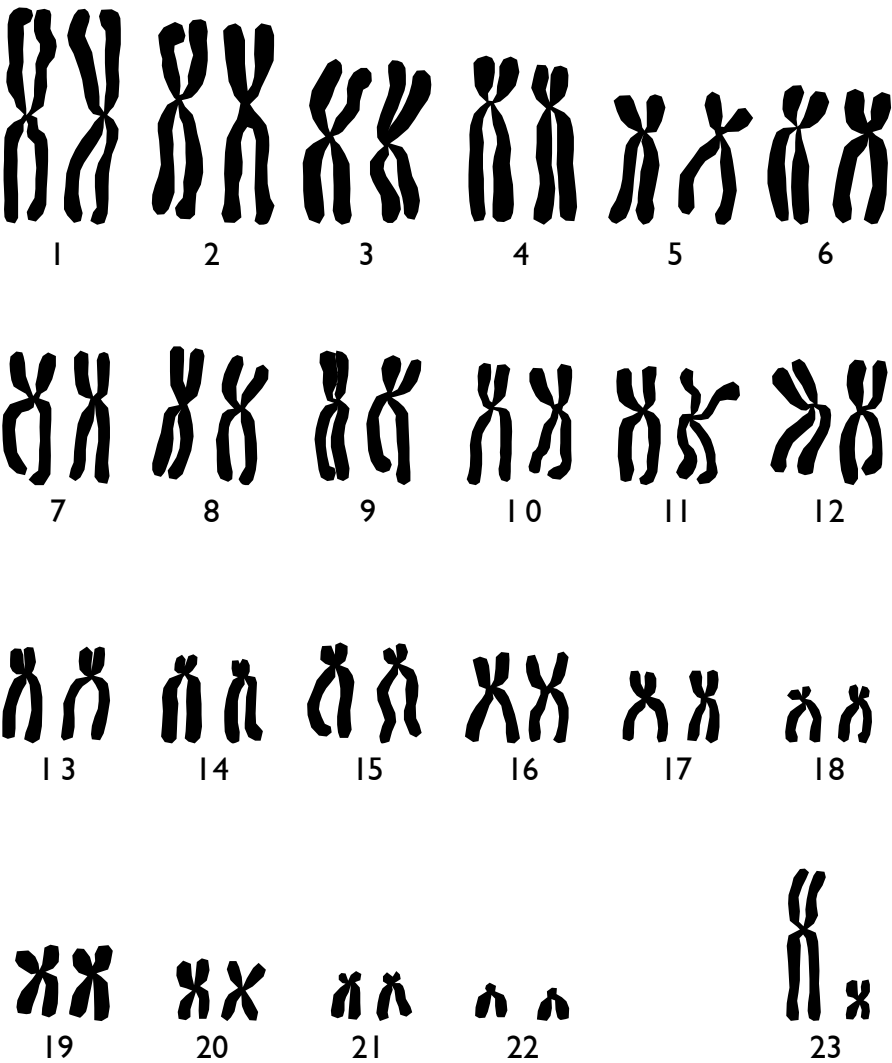


Normal human karyotype - B



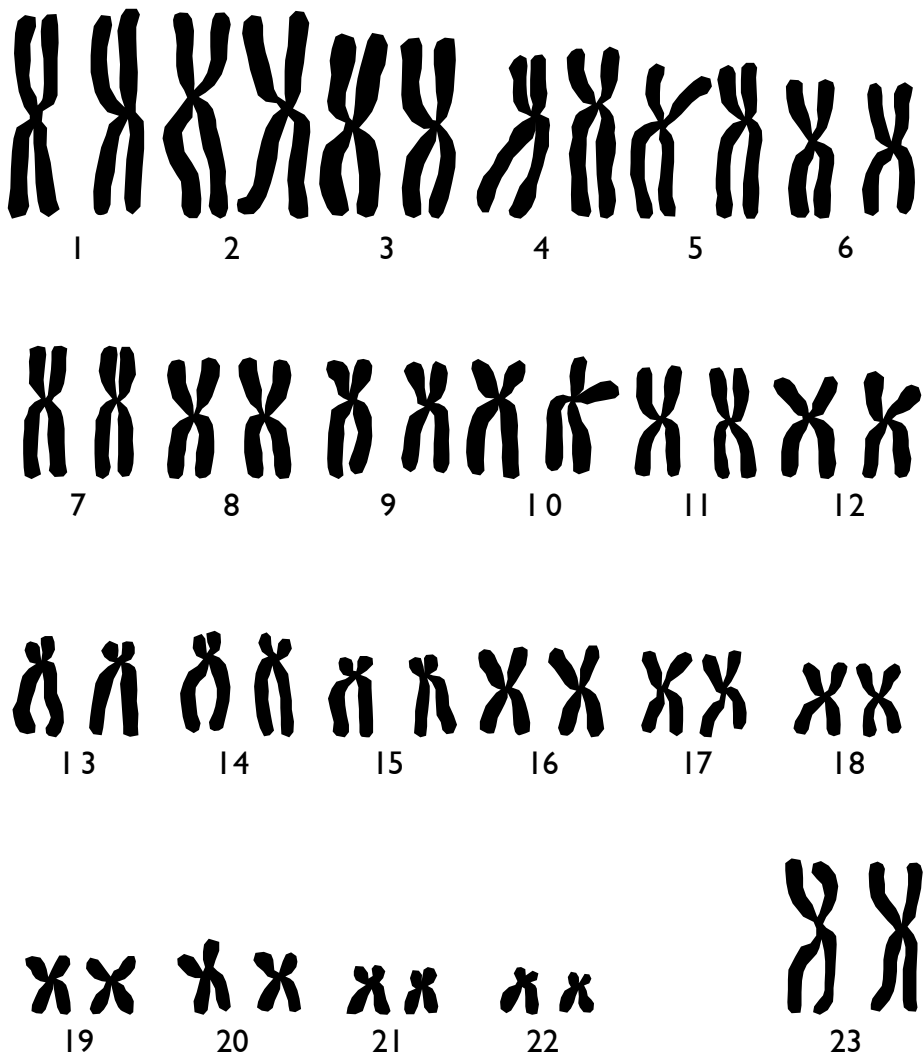
Human karyotype analysed into homologous pairs

Normal Human Male



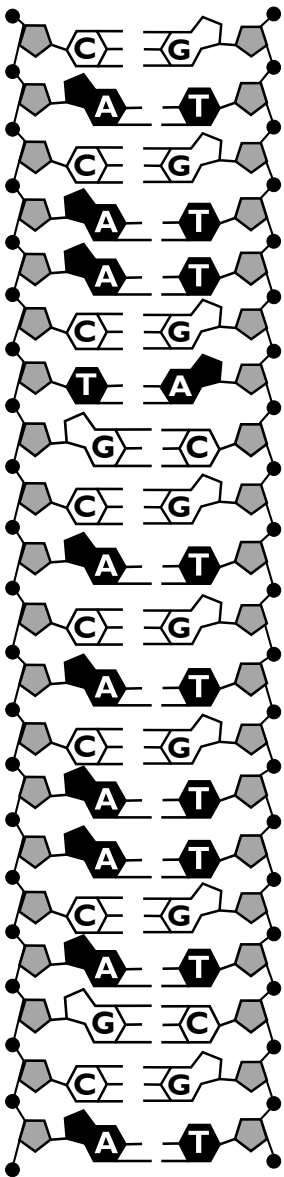
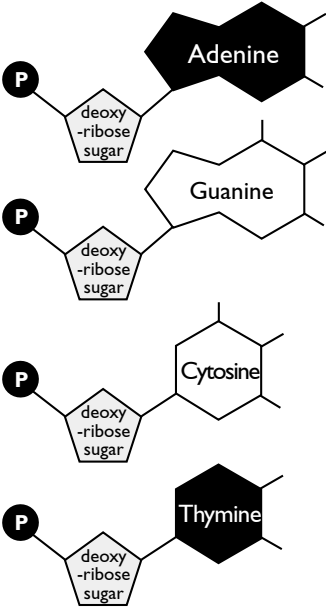
Human karyotype
analysed into homologous pairs

Normal Human Female

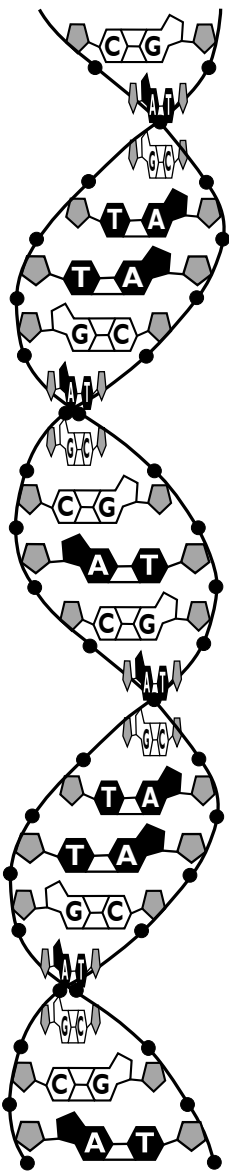


Structure of DNA

The Nucleotides of DNA

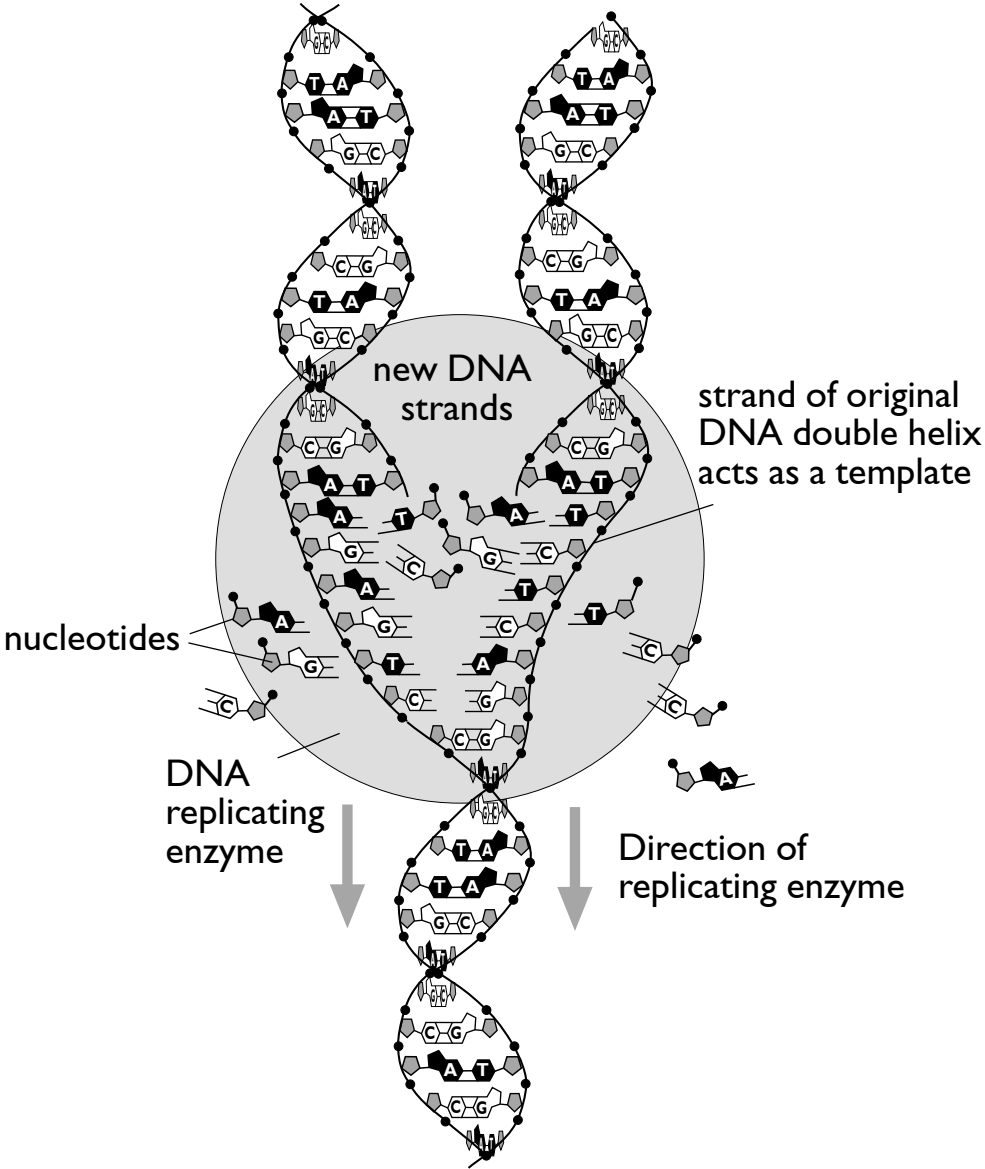


Continued



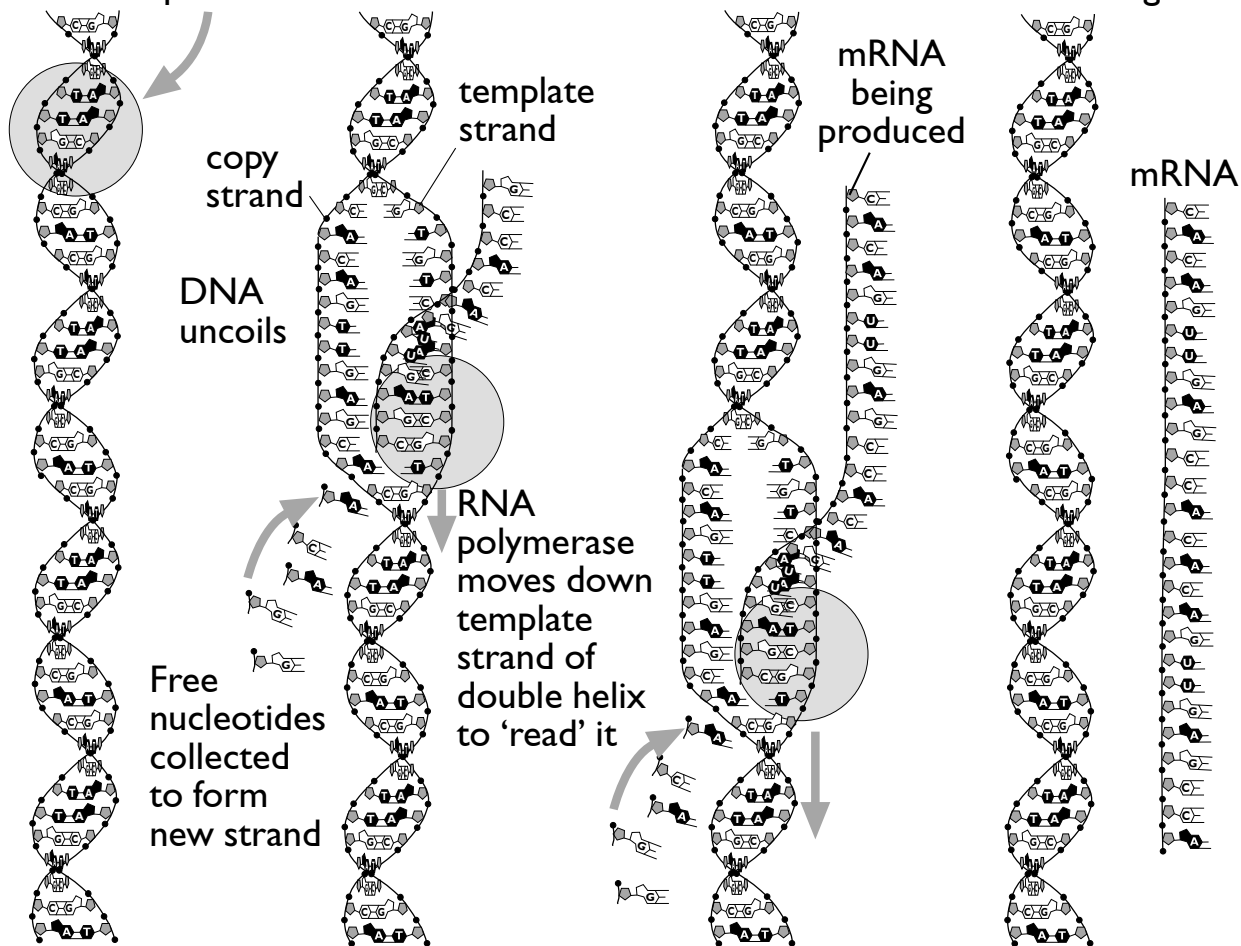
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Replication of DNA



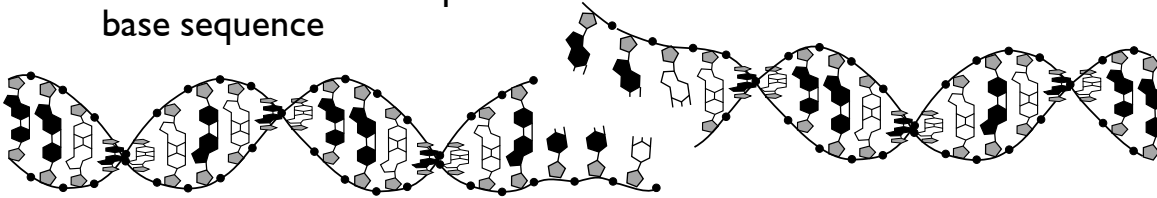
RNA polymerase attaches to DNA strand at specific codon site

DNA double helix rewinds to original

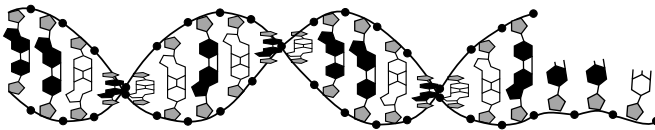


Action of restriction and ligase enzymes

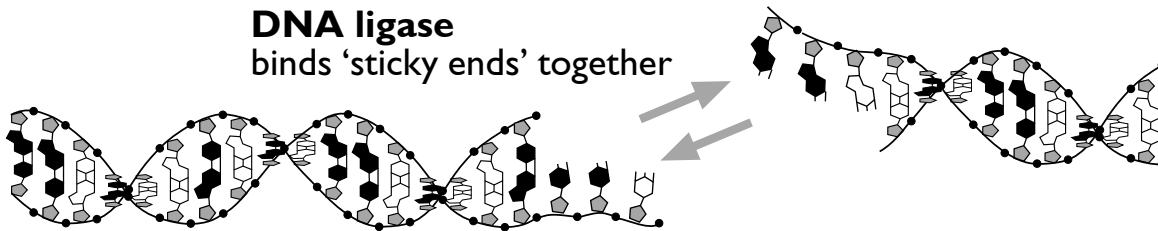
Restriction endonuclease
breaks the chain at a specific
base sequence



'Sticky end'
results from the staggered cut



DNA ligase
binds 'sticky ends' together



Translation of mRNA code to build a polypeptide

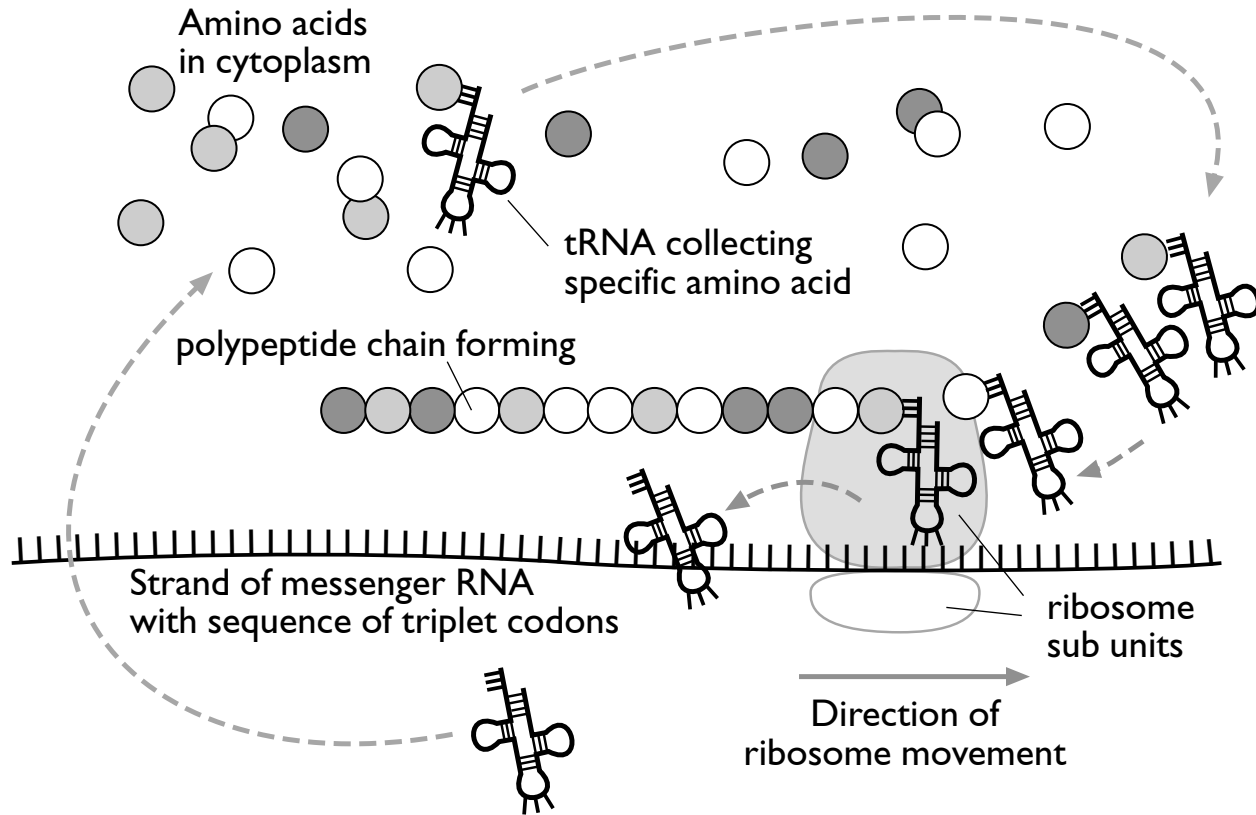
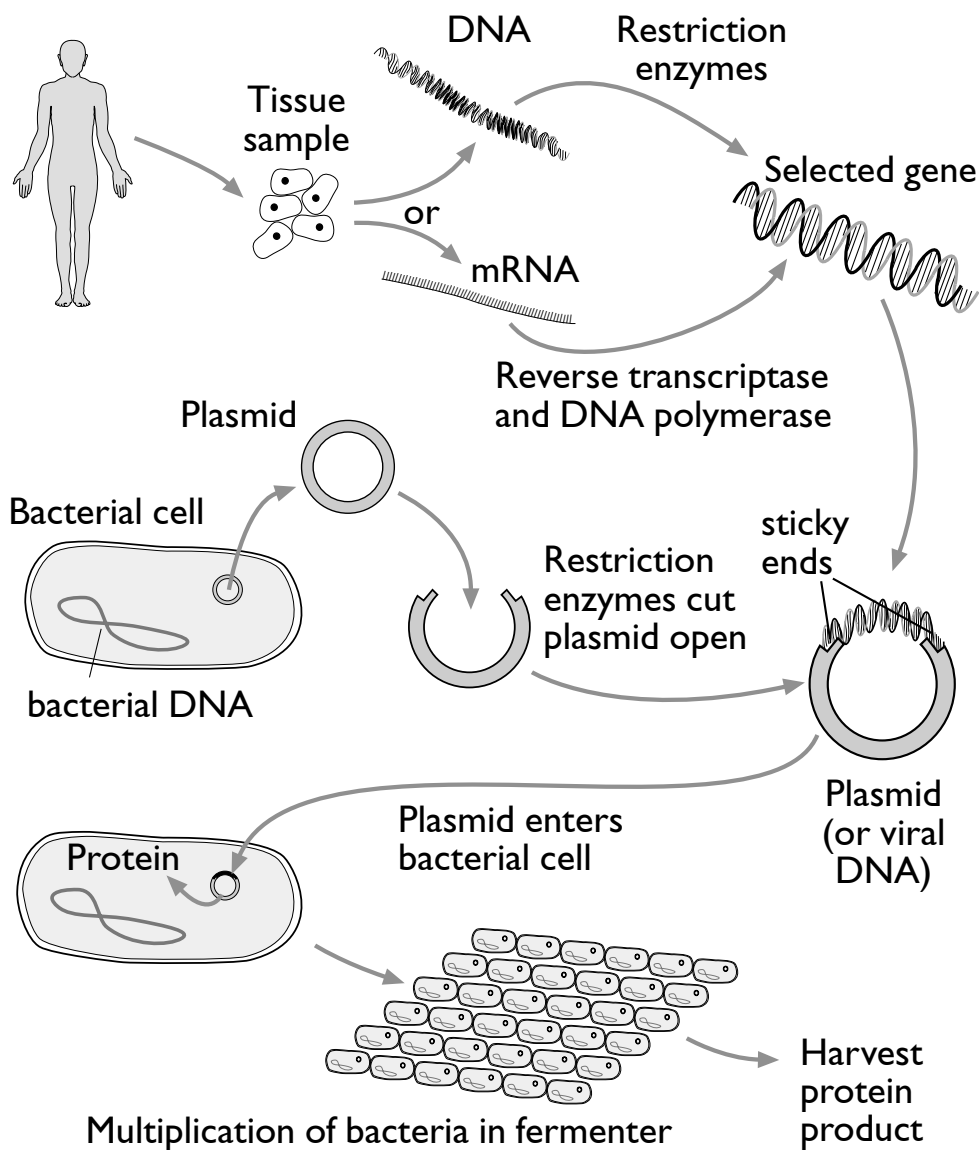


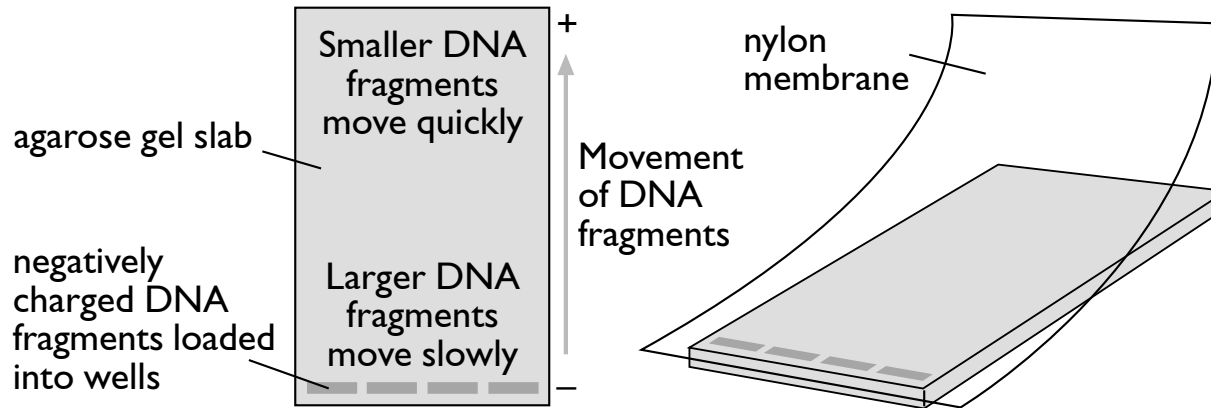
Table of Amino Acid Codons

Amino acid	Abbr.	mRNA codons	Essential
Alanine	Ala	GCA, GCC, GCG, GCU	
Arginine	Arg	AGA, AGG, CGA, CGC, CGG, CGU	infants only
Asparagine	Asn	AAC, AAU	
Aspartic acid	Asp	GAC, GAU	
Cysteine	Cys	UGC, UGU	
Glutamic acid	Glu	GAA, GAG	
Glutamine	Gln	CAA, CAG	
Glycine	Gly	GGA, GGC, GGG, GGU	
Histidine	His	CAC, CAU	infants only
Isoleucine	Ile	AUA, AUC, AUU	E
Leucine	Leu	CUA, CUC, CUG, CUU, UUA, UUG	E
Lysine	Lys	AAA, AAG	E
Methionine	Met	AUG (Start codon)	E
Phenylalanine	Phe	UUC, UUU	E
Proline	Pro	CCA, CCC, CCG, CCU	
Serine	Ser	AGC, AGU, UCA, UCC, UCG, UCU	
Threonine	Thr	ACA, ACC, ACG, ACU	E
Tryptophan	Trp	UGG	E
Tyrosine	Tyr	UAC, UAU	
Valine	Val	GUA, GUC, GUG, GUU	E
STOP CODONS		UAA, UAG, UGA	

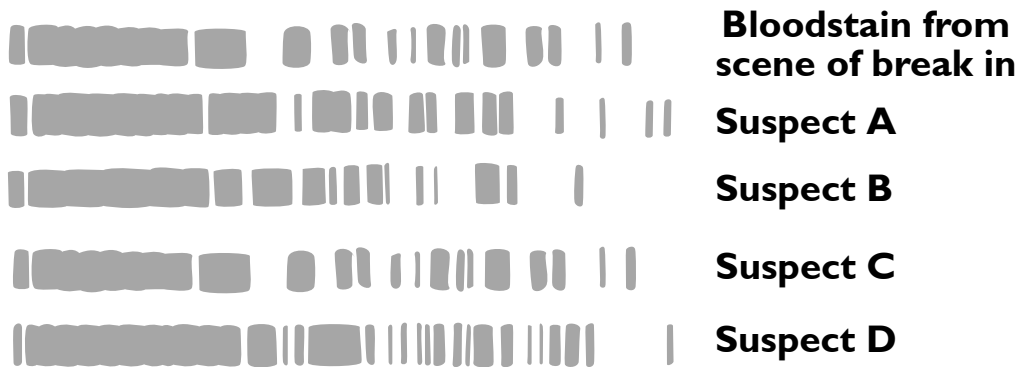
Genetic engineering



- 1 Extracted DNA e.g. from white blood cells, semen etc.
- 2 DNA cut into pieces by **Restriction Enzymes**
- 3 DNA pieces are separated by **Gel Electrophoresis** this takes 24 hours



- 4 **Southern Blotting**, the DNA fragments are transferred (blotted) onto a nylon membrane laid on top of the gel slab.
- 5 **Gene Probe Treatment** - the nylon membrane is put into a tank of single strand DNA's (probes) which are complementary to specific core DNA sequences and bind to them. The probes may be radioactive or fluorescent. Excess probes are washed off
- 6 X Ray film is placed on the membrane and the typical bands appear where the presence of **radioactive/fluorescent probes** fog the film.
- 7 The X Ray film is processed to form the **DNA Fingerprint** with its characteristic 'barcode' pattern of dark bands.



Cystic Fibrosis

Cystic Fibrosis

Mutation causes the deletion of 3 bases in DNA
so that one amino acid (phenylalanine)
is not coded for in the CFTR protein
(Cystic fibrosis transmembrane regulator)



Faulty CFTR protein cannot control the opening of
chloride channels in the cell membrane



Results in production of thick sticky mucus,
especially in lungs, pancreas and liver
Organs cannot function normally
and infection becomes more likely

Treatment by Gene Therapy

CFTR gene identified on chromosome 7 in 1989

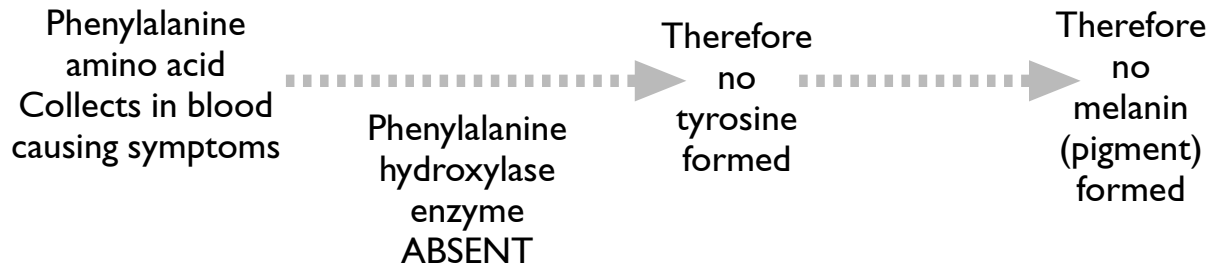
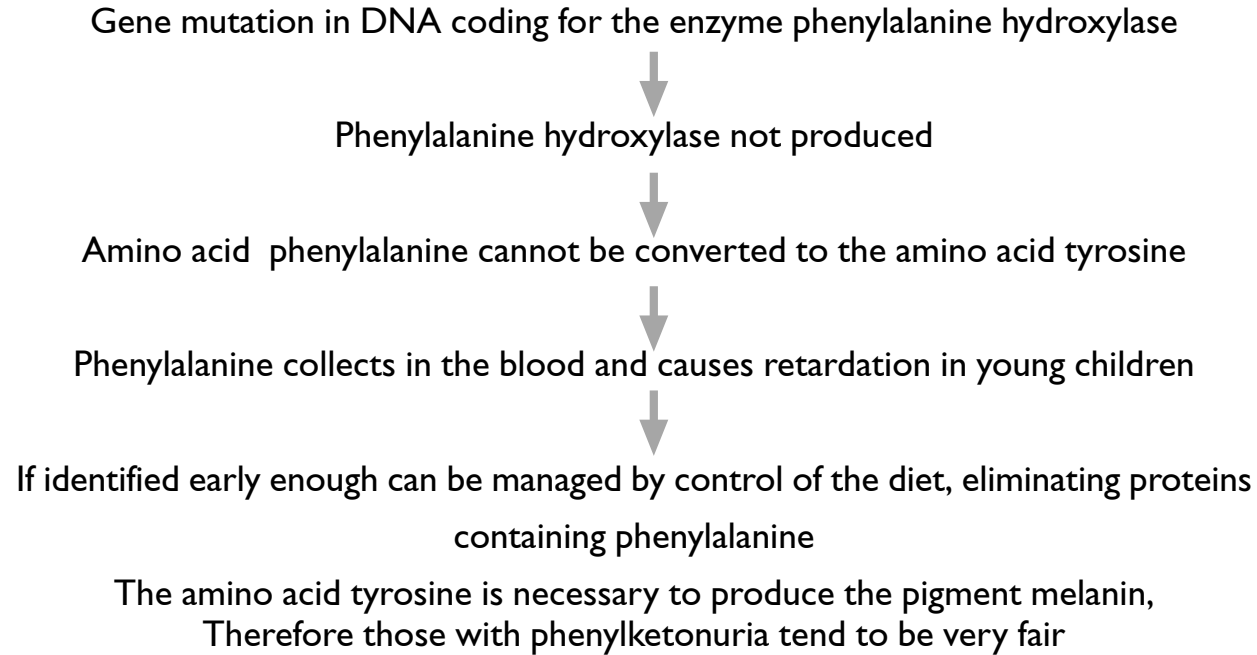
The normal gene for CFTR protein is inserted into
a bacterial plasmid (DNA).

This is enclosed in a liposome (hollow lipid container)

The liposomes are introduced into the body
of the sufferer using a nasal spray

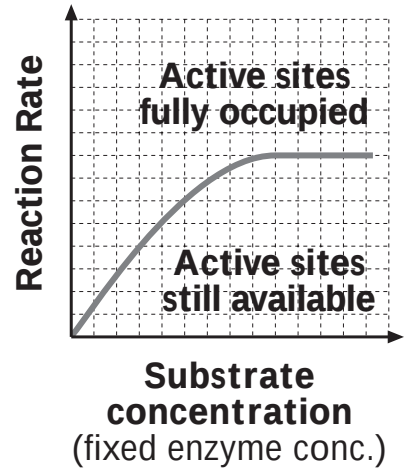
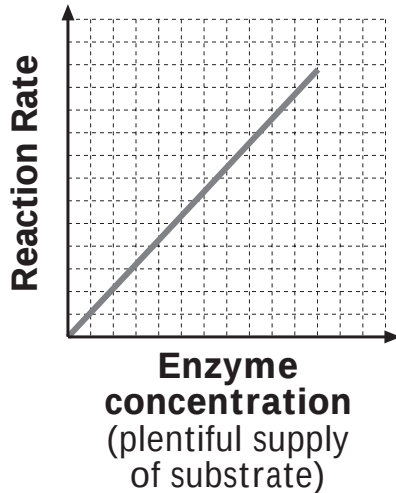
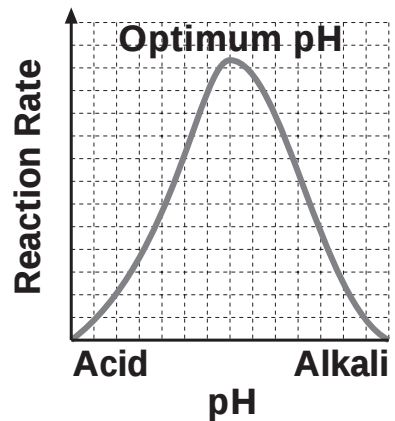
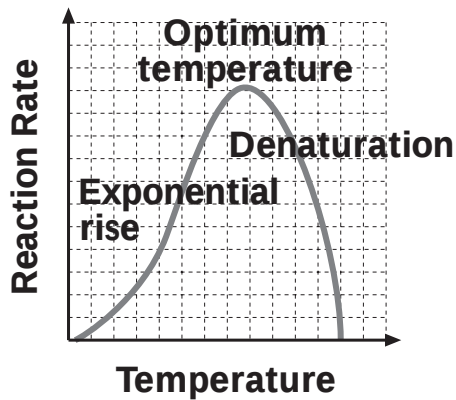
The liposomes reach the lung epithelial cells and
hopefully some of the normal CFTR genes are
incorporated into the cells' DNA.

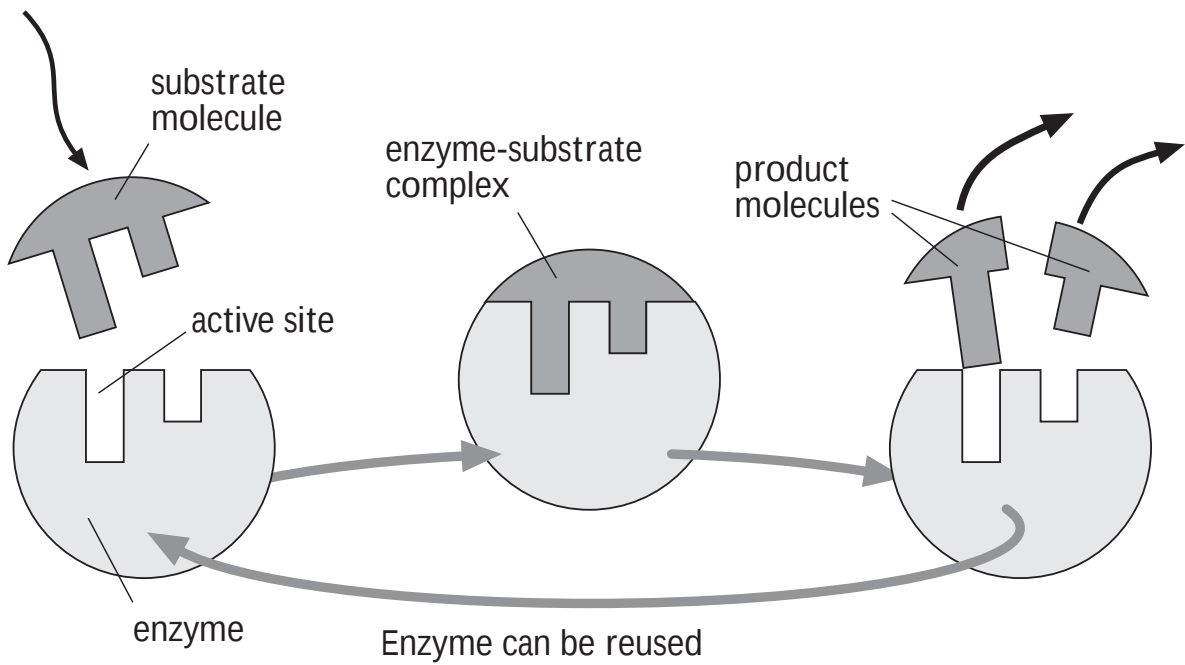
(The normal gene could also be introduced using a 'safe' virus)

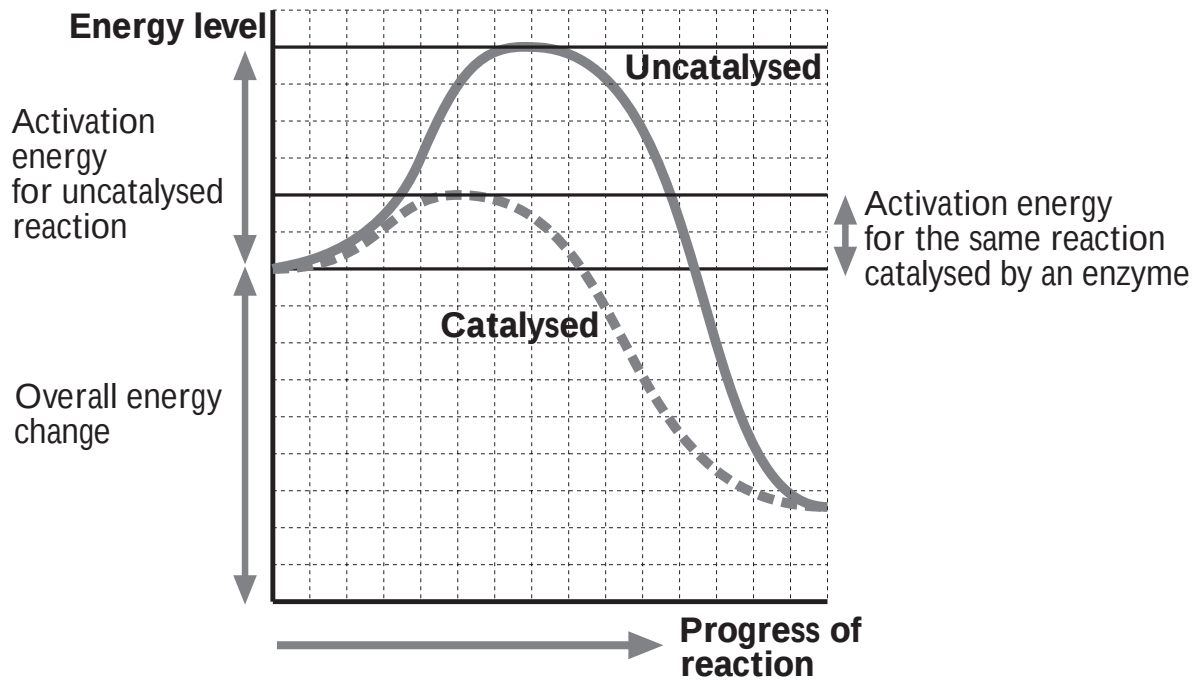


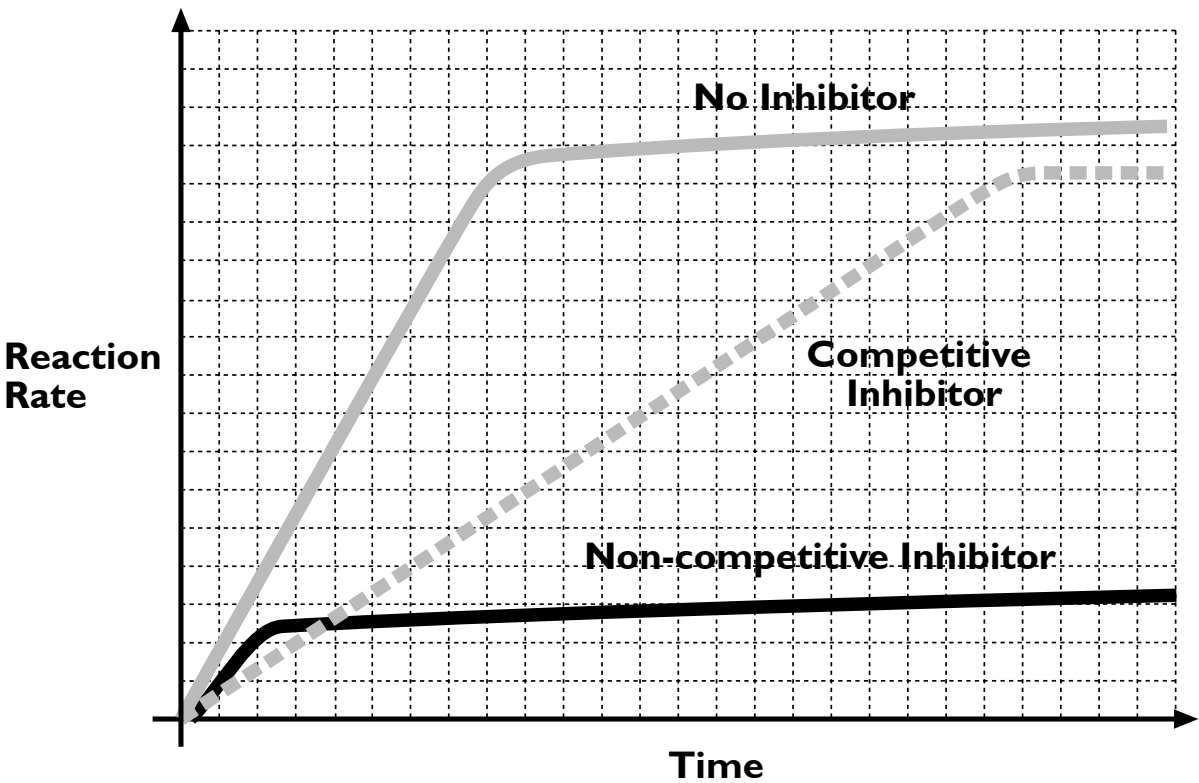
ENZYME CATALYSED REACTIONS

Temperature, pH, enzyme
and substrate concentration



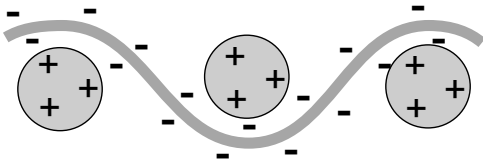




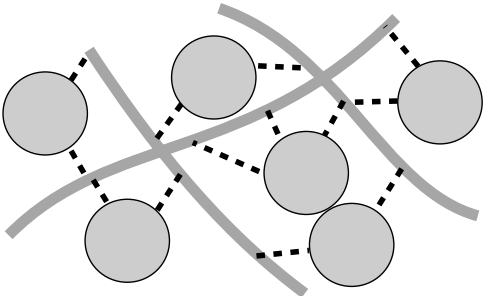


Immobilisation of enzymes

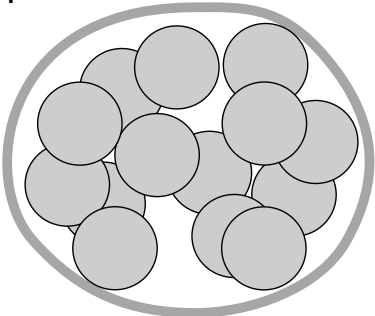
Absorbption



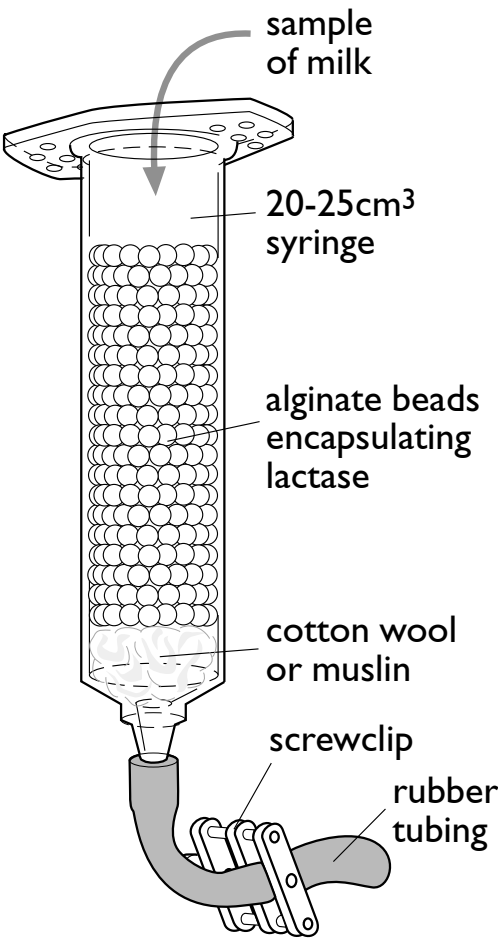
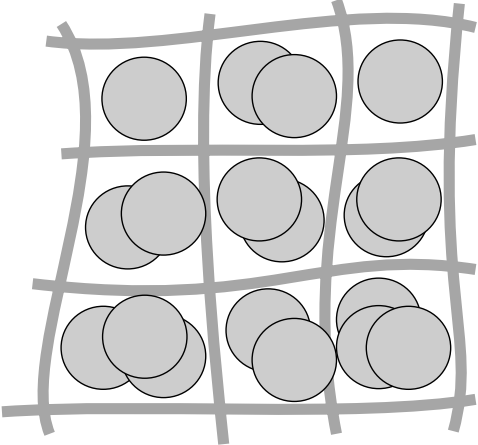
Covalent binding



Encapsulation



Entrapment



Fermenter

